PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY

HELD AT PHILADELPHIA FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXXI. JULY TO DECEMBER, 1893. NO. 142.

TABLE OF CONTENTS.

	PAGE
Stated Meeting, September 1, 1893	233
Stated Meeting, September 15, 1893	242
Stated Meeting, October 6, 1893	247
Stated Meeting, October 20, 1893	252
A Notice of William Barton Rogers. *By W. S. W. Ruschenberger, M.D.*	254
The Native Calendar of Central America and Mexico. A Study in Linguistics and Symbolism. *By Daniel G. Brinton, M.D.*	258
The Great Mesozoic Fault in New Jersey (with one plate). *By Benjamin Smith Lyman*	314
On the genus Tomiopsis. *By E. D. Cope*	317
The Conservation of Osmazome in Roasting (with two figures). *By R. Meade Bache*	318
A Vocabulary of the Nanticoke Dialect. *By Daniel G. Brinton, M.D.*	325
Second Addition to the Knowledge of the Batrachia and Reptilia of Costa Rica. *By E. D. Cope*	333
Stated Meeting, November 3, 1893	348
Stated Meeting, November 17, 1893	351
Stated Meeting, December 1, 1893	355
Stated Meeting, December 15, 1893	356
Obituary Notice of Joseph Zentmayer (with one plate). *By Charles A. Oliver, M.D.*	358
Volumes and Dates of Proceedings and Transactions of the American Philosophical Society	365

☞ It is requested that the receipt of this number be acknowledged.

☞ In order to secure prompt attention it is requested that all correspondence be addressed simply "To the Secretaries of the American Philosophical Society, 104 S. Fifth St., Philadelphia."

PUBLISHED FOR THE SOCIETY

BY

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NOS. 237-9 DOCK STREET, PHILADELPHIA.

EXTRACT FROM THE LAWS.

CHAPTER XII.

OF THE MAGELLANIC FUND.

SECTION 1. John Hyacinth de Magellan, in London, having in the year 1786 offered to the Society, as a donation, the sum of two hundred guineas, to be by them vested in a secure and permanent fund, to the end that the interest arising therefrom should be annually disposed of in premiums, to be adjudged by them to the author of the best discovery, or most useful invention, relating to Navigation, Astronomy, or Natural Philosophy (mere natural history only excepted); and the Society having accepted of the above donation, they hereby publish the conditions, prescribed by the donor and agreed to by the Society, upon which the said annual premiums will be awarded.

CONDITIONS OF THE MAGELLANIC PREMIUM.

1. The candidate shall send his discovery, invention or improvement, addressed to the President, or one of the Vice-Presidents of the Society, free of postage or other charges; and shall distinguish his performance by some motto, device, or other signature, at his pleasure. Together with his discovery, invention, or improvement, he shall also send a sealed letter containing the same motto, device, or signature, and subscribed with the real name and place of residence of the author.

2. Persons of any nation, sect or denomination whatever, shall be admitted as candidates for this premium.

3. No discovery, invention or improvement shall be entitled to this premium, which hath been already published, or for which the author hath been publicly rewarded elsewhere.

4. The candidate shall communicate his discovery, invention or improvement, either in the English, French, German, or Latin language.

5. All such communications shall be publicly read or exhibited to the Society at some stated meeting, not less than one month previous to the day of adjudication, and shall at all times be open to the inspection of such members as shall desire it. But no member shall carry home with

Received *of the American Philosophical Society Proceedings No. 142.*

Name,.....

Address,.....

N. B.—Please detach this page when signed, and return, prepaid, to the Secretaries.

ERRATUM.

Page 132, thirteenth line from top, *should read:*

"The President was authorized to appoint a suitable person to prepare the usual obituary notice."

PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY

HELD AT PHILADELPHIA FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXXI. JULY TO DECEMBER, 1893. No. 142.

Stated Meeting, September 1, 1893.

Prof. ALBERT H. SMYTH in the Chair.

Correspondence was submitted as follows:

Acknowledgments of election to membership were received from

Prof. Isaac H. Hall, New York.
Gen. Isaac J. Wistar, Philadelphia.
Mr. Edward Vincent d'Invilliers, Philadelphia.
Prof. Waterman L. Hewitt, Ithaca, N. Y.
Prof. Justin Winsor, Cambridge, Mass.
Prof. William Hyde Appleton, Swarthmore, Pa.
President James E. Rhoads, Bryn Mawr, Pa.

An invitation from the New Haven Colony Historical Society, New Haven, Conn., to be present at the dedication of the new building erected as a memorial to James E. and Caroline A. English, to take place September 28, 1893, at 8 P.M.

A circular from the Congrès International de Zoölogie, Paris, relative to the prizes which will be awarded by the Congrès.

A circular from the Anthropological Society of Washington in regard to the Citizenship Prizes to be awarded for essays on specified subjects.

A letter from the U. S. Coast and Geodetic Survey, Washington, D. C., requesting certain numbers of the Society's Proceedings and Transactions to complete their set.

PROC. AMER. PHILOS. SOC. XXXI. 142. 2 D. PRINTED NOV. 15, 1893.

The following communication was read and referred to the Curators:

AMERICAN HISTORICAL ASSOCIATION, SMITHSONIAN INSTITUTION,
WASHINGTON, D. C., August 2, 1893.

THE SECRETARY OF THE AMERICAN PHILOSOPHICAL SOCIETY,
PHILADELPHIA, PA.:

Dear Sir:—I am desirous of obtaining for the use of the American Historical Association definite information regarding the collections of the various Historical Societies in the United States. I have been informed that under the supervision of your Society an interesting collection of historical objects has grown up. May I ask your assistance in furnishing me with a few lines explaining the scope of the collection, with a little history of its growth, and the names of those who have been and are now most conspicuous in its development. If a catalogue of the collection has been published, may I beg that you will furnish me with a copy.

I am, sir, yours very respectfully,

A. HOWARD CLARK,
Assistant Secretary of the American Historical Association, Curator Hist. Coll., U. S. N. M.

Letters of envoy were received from the Geological Survey of India, Calcutta; Royal Society of New South Wales, Sydney; Societas pro Fauna et Flora Fennica, Helsingfors, Finland; Fondation de P. Teyler van der Hulst, Harlem, Holland; K. Danske Videnskabernes Selskab, Copenhagen; Université Royale, Lund, Sweden; Naturforschende Verein, Brünn, Austria; Verein für Erdkunde, Dresden, Saxony; Wetterauische Gesellschaft für die Gesammte Naturkunde, Hanau, Hesse; K. Sächsische Gesellschaft der Wissenschaften, Leipzig, Saxony; Gesellschaft zur Beförderung der Gesammten Naturwissenschaften, Marburg, Prussia; Naturwissenschaftliche Verein, Osnabrück, Prussia; Royal Observatory, Greenwich, England; Zoölogical Society, Meteorological Office, Statistical Society, London, England; Museum of Comparative Zoölogy, Cambridge, Mass.; Meteorological Observatory, New York; Direccion General de Estadistica, Mexico, Mexico; Observatorio N. Argentino, Cordoba, Argentine Republic.

Letters of acknowledgment (Trans. xvii, 3, and xviii, 1) were received from the Geological and Natural History Survey, Ottawa, Canada; Public Library, Boston, Mass.; Museum of

Comparative Zoölogy, Cambridge, Mass.; American Antiquarian Society, Worcester, Mass.; Yale University, New Haven, Conn.; University of the State of New York, Albany; Buffalo Library; New York Historical Society; Astor Library, New York; United States Military Academy, West Point, N. Y.; New Jersey Historical Society, Newark, N. J.; Academy of Natural Sciences; Franklin Institute, Philadelphia; Smithsonian Institution, Washington, D. C.; University of California, Berkeley; State Historical Society of Wisconsin, Madison; Kansas Academy of Science, Topeka.

Letters of acknowledgment were received from the Anthropologische Gesellschaft, Profs. Franz Ritt v. Hauer, F. S. Krauss, Vienna, Austria (139); Anthropologische Gesellschaft, K. Bibliothek, Gesellschaft für Erdkunde, K. P. Meteorologische Institut, Physikalische Gesellschaft, Berlin, Prussia (139); University of Bonn (139); K. Sächsische Meteorologische Institut, Chemnitz (139); K. Sächsische Altertumsverein, Verein für Erdkunde, Dresden (139); Prof. Otto Böhtlingk, Leipzig, Germany (139, 140); K. P. Geodätische Institut, Potsdam, Prussia (139); Naturwissenschaftliche Verein für Schleswig-Holstein, Kiel, Prussia (139); Verein für Vaterländische Naturkunde in Würtemberg, Stuttgart (139); Prof. Robert W. Bunsen, Heidelberg, Germany (139); Société de Geographie (131–134), Naturhistorische Gesellschaft (139), Schweizerische Naturforschende Gesellschaft, Berne (139); Prof. Carl Vogt, Geneva, Switzerland (139); Société Vaudoise des Sciences Naturelles, Lausanne (139, 140); Mr. Samuel Timmins, Arley, Coventry, England (139, 140); Philosophical Society, Cambridge, England (139, 140); Sir Rawson W. Rawson (139), Institution of Civil Engineers, London, England (131–139); Geographical Society, Manchester, England (139, 140); R. Geological Society of Ireland, Dublin (139, 140); Royal Observatory, Prof. James Geikie, Edinburgh, Scotland (139, 140); Société d'Histoire et d'Archéologie, Chalon-sur-Saone, France (137–140); Société N. des Sciences Naturelles et Mathématique, Cherbourg, France (136); Université de Lyon (139, 140); Rédaction de "Cosmos," Paris,

France (131–136, 139); Yale University, New Haven, Conn. (139); Prof. G. L. Goodall, Cambridge, Mass. (137–139); Prof. James Ellis Humphrey, Weymouth Heights, Mass. (137–140); Kentucky Historical Society, Frankfort (137); Instituto Fisico-Geografico Nacional, San Jose de Costa Rica, Central America (138); Museo Nacional, Santiago, Chile (137).

Letters of acknowledgment (140) were received from the Geological Survey, Ottawa, Canada; Université Laval, Hon. J. M. Le Moine, Quebec; Dr. Alfred R. C. Selwyn, Montreal; Canadian Institute, Toronto; Bowdoin College Library, Brunswick, Me.; Experiment Station, Orono, Me.; Society of Natural History, Portland, Me.; Prof. Charles H. Hitchcock, Hanover, N. H.; Amherst College Library, Amherst, Mass.; Marine Biological Laboratory, Massachusetts Institute of Technology, Boston; Society of Natural History, Massachusetts Historical Society, State Library of Massachusetts, Messrs. T. M. Drown, Hamilton A. Hill, Robert C. Winthrop, Boston, Mass.; Museum of Comparative Zoölogy, Prof. G. L. Goodall, Mr. Robert N. Toppan, Cambridge, Mass.; Free Public Library, New Bedford, Mass.; Rev. Edward E. Hale, Roxbury, Mass.; Essex Institute, Salem, Mass.; American Antiquarian Society, Worcester, Mass.; Rhode Island Agricultural Experiment Station, Kingston, R. I.; Providence Franklin Society, Rhode Island Historical Society, Providence; Mr. George F. Dunning, Farmington, Conn.; Hartford Theological Seminary, Connecticut Historical Society, Hartford; New Haven Colony Historical Society, Profs. O. C. Marsh, H. A. Newton, W. D. Whitney, New Haven, Conn.; Prof. James Hall, Albany, N. Y.; Society of Natural Science, Buffalo Library, Buffalo, N. Y.; Profs. T. F. Crane, B. G. Wilder, Ithaca, N. Y.; Astor Library, American Museum of Natural History, New York Historical Society, New York Academy of Medicine, New York Hospital, Profs. Joel A. Allen, Daniel Draper, Henry F. Osborn, John J. Stevenson, New York, N. Y.; Vassar Brothers' Institute, Poughkeepsie, N. Y.; Prof. W. Le Conte Stevens, Troy, N. Y.; Oneida Historical Society, Utica, N. Y.; U. S. Military Academy, West Point, N. Y.; Free Public

Library, Jersey City; New Jersey Historical Society, Newark; Profs. W. Henry Green, C. A. Young, Princeton, N. J.; Dr. Robert H. Allison, Ardmore, Pa.; Prof. Robert W. Rogers, Carlisle, Pa.; Prof. M. H. Boyé, Coopersburg, Pa.; Hon. Eckley B. Coxe, Drifton, Pa.; Dr. Traill Green, Prof. J. W. Moore, Rev. Thomas C. Porter, Easton, Pa.; Mr. Andrew S. McCreath, Harrisburg, Pa.; Prof. Lyman B. Hall, Haverford, Pa.; Mr. John Fulton, Johnstown, Pa.; Linnean Society, Lancaster, Pa.; Mr. P. F. Rothermel, Linfield, Pa.; Dr. F. A. Muhlenberg, Reading, Pa.; University of Pennsylvania, Library Company of Philadelphia, *The Medical News*, Wagner Free Institute of Science, Academy of Natural Sciences, Historical Society of Pennsylvania, Numismatic and Antiquarian Society, Mercantile Library, Admiral E. Y. Macauley, Hon. James T. Mitchell, Hon. Henry Reed, Profs. John Ashhurst, Jr., E. D. Cope, F. A. Genth, Jr., H. V. Hilprecht, E. O. Kendall, J. P. Lesley, John M. Maisch, Albert H. Smyth, Drs. John H. Brinton, Persifor Frazer, George Friebis, John Marshall, George R. Morehouse, Isaac Norris, Charles A. Oliver, C. N. Peirce, W. S. W. Ruschenberger, H. Clay Trumbull, William H. Wahl, Messrs. Arthur E. Brown, R. Meade Bache, Charles Bullock, Thomas M. Cleemann, Patterson Du Bois, Robert Patterson Field, J. S. Harris, Francis Jordan, Jr., William W. Jefferis, Henry Phillips, Jr., Franklin Platt, Theodore D. Rand, J. G. Rosengarten, L. A. Scott, Talcott Williams, Charles Stewart Wurts, Mrs. Helen Abbott Michael, Philaphia; Prof. John T. Carll, Pleasantville, Pa.; Mr. Heber S. Thompson, Pottsville, Pa.; Rev. George W. Anderson, Rosemont, Pa.; Dr. John Curwen, Warren, Pa.; Mr. Philip P. Sharples, Hon. Washington Townsend, West Chester, Pa.; Mr. William M. Canby, Wilmington, Del.; U. S. Naval Institute, Annapolis, Md.; Enoch Pratt Free Library, Baltimore, Md.; Mr. T. Leeper Patterson, Cumberland, Md.; Smithsonian Institution, U. S. Naval Observatory, Anthropological Society, U. S. Weather Bureau, U. S. Coast and Geodetic Survey, Library Surgeon-General's Office, U. S. Geological Survey, Dr. J. S. Billings, Prof. S. F. Emmons, Dr. W. J. Hoff-

man, Prof. Charles A. Schott, Mr. W. B. Taylor, Washington, D. C.; University of Virginia, Charlottsville; Journal U. S. Artillery, Fortress Monroe, Va.; Agricultural Experiment Station, Morgantown; Prof. J. W. Mallet, University of Virginia, Va.; Agricultural Experiment Station, Raleigh, N. C.; Georgia Historical Society, Savannah; University of Alabama, Tuscaloosa; Agricultural Experiment Station, Baton Rouge, La.; Texas Academy of Science, Austin; Museo Oaxaqueño, Oaxaca de Juárez, Mex.; Observatorio Astronomico Nacional, Tacubaya, Mex.; Agricultural Experiment Station, Las Cruces, N. M.; Prof. E. W. Claypole, Akron, O.; University of Cincinnati, Cincinnati Observatory, Society of Natural Science, Cincinnati, O.; Oberlin College; Rev. Henry S. Osborn, Oxford, O.; Kentucky Historical Society, Frankfort; Dr. Robert Peter, Lexington, Ky.; University of California; Prof. Joseph LeConte, Berkeley, Cal.; Lick Observatory; Mt. Hamilton, Cal.; Prof. J. C. Branner, Palo Alto, Cal.; Prof. Daniel Kirkwood, Riverside, Cal.; Prof. George Davidson, San Francisco, Cal.; Geological Survey of Missouri, Jefferson City; Academy of Sciences, St. Louis, Mo.; Arkansas Agricultural Experiment Station, Fayetteville; Purdue Experiment Station, La Fayette, Ind.; Historical Society, Chicago, Ill.; Academy of Natural Sciences, Davenport, Ia.; State University of Iowa, Iowa City; Wisconsin State Historical Society, Madison; Agricultural Experiment Station, Lincoln, Neb.; State Agricultural College, Manhattan, Kans.; Academy of Sciences, State Historical Society, Washburn College, Topeka, Kans.; Agricultural Experiment Station, St. Anthony Park, Minn.; Tacoma Academy of Science, Tacoma, Wash.

Letters of acknowledgment (141) were received from Dr. Charles B. Dudley, Altoona, Pa.; Dr. Robert H. Alison, Ardmore, Pa.; Prof. James E. Rhoads, Bryn Mawr, Pa.; Dr. Charles F. Himes, Carlisle, Pa.; Prof. Martin H. Boyé, Coopersburg, Pa.; Hon. Eckley B. Coxe, Drifton, Pa.; Drs. Traill Green, J. W. Moore, Thomas C. Porter, Easton, Pa.; Mr. Andrew S McCreath, Harrisburg, Pa.; Mr. John Ful-

ton, Johnstown, Pa.; Linnean Society, Lancaster, Pa.; Numismatic and Antiquarian Society, Historical Society of Pennsylvania, Academy of Natural Sciences, Library Company of Philadelphia, Hon. Joseph Allison, Prof. John Ashhurst, Jr., Messrs. R. Meade Bache, Henry C. Baird, Cadwalader Biddle, Patterson DuBois, Jacob B. Eckfeldt, Robert P. Field, Dr. Henry Hartshorne, Prof. H. H. Houston, Messrs. William A. Ingham, E. V. d'Invilliers, Francis Jordan, Jr., Prof. J. P. Lesley, Dr. John Marshall, Mrs. Helen Abbott Michael, Drs. Isaac Norris, Charles A. Oliver, C. N. Peirce, William Pepper, Messrs. Franklin Platt, Theodore D. Rand, J. G. Rosengarten, Dr. W. S. W. Ruschenberger, Prof. Benjamin Sharp, Rev. H. Clay Trumbull, Prof. James Tyson, Messrs. W. P. Tatham, D. K. Tuttle, Samuel Wagner, Philadelphia; Prof. John F. Carll, Pleasantville, Pa.; Mr. Heber S. Thompson, Pottsville, Pa.; Rev. F. A. Muhlenberg, Reading, Pa.; Dr. W. H. Appleton, Swarthmore, Pa.; Philosophical Society, Mr. Philip P. Sharples, Hon. Washington Townsend, Prof. J. T. Rothrock, West Chester, Pa.

Accessions to the Library were reported from the Government Geologist, Adelaide, Australia; Royal Society of N. S. Wales. Hon. Arthur Renwick, Sydney; New Zealand Institute, Wellington; Tokyo Library, Tokyo, Japan; Madras Observatory, Madras, India; R. Asiatic Society (China Branch), Shanghai, China; Societatea Geographica Româna, Bucuresci; Societates pro Fauna et Flora Fennica, Helsingfors, Finland; Société Physico Mathématique, Kasan, Russia; K. Mineralogische Gesellschaft, Comité Géologique, Bibliothèque Géologique, Société de Géographie, Prof. Serge Nikitin, St. Petersburg, Russia; K. Norsk. Oldskrift Selskab, K. Danske Videns-Rabernes Selskab, Copenhagen, Denmark; Bataviaasch Genootschap van Kunsten en Wetenschappen; Friesch Genootschap van Geschied, etc., Leewarden, Friesland; Musée Teyler, Haarlem, Holland; Academie R. de Belgique, Société R. Malacologique de Belgique, Bruxelles; Naturforschende Verein, Brünn, Austria; K. K. Sternwarte, Prag, Bohemia; I. R. Accademia degli Agiati, Roveredo, Tyrol; K. P.

Geologische Landesanstalt und Bergakademie, Berlin, Prussia; Verein für Schlesische Insektenkunde, Breslau, Prussia; Sächsische Meteorologische Institut, Chemnitz, Saxony; Naturwissenschaftliche Gesellschaft "Isis," Verein für Erdkunde, Dresden, Saxony; K. Gesellschaft der Wissenschaften, Göttingen, Prussia; Wetterauische Gesellschaft für die Gesammte Naturkunde, Hanau a.-M.; Gesellschaft zur Beförderung der gesammten Naturwissenschaften, Marburg, Prussia; Bayerische Botanische Gesellschaft, Munich, Bavaria; Dr. P. Steiner, Neuwied, Germany; Naturwissenschaftliche Verein, Osnabrück, Prussia; Verein für Vaterländische Naturkunde in Würtemberg, Stuttgart; Commission Internationale de la carte Geologique d'Europe, Prof. E. Renevier, Lausanne, Switzerland; Société Neuchâteloise de Geographie, Neuchâtel, Switzerland; R. Accademia di Scienze, etc., Modena, Italy; Accademia dei Lincei, Prof. Guiseppi Sergi, Rome, Italy; Société Linnéene, Bordeaux, France; Société Languedocienne de Géographie, Montpellier, France; Prof. Dr. Jules Oppert, Paris, France; Société de Géographie, Lisbon, Portugal; Philosophical Society, University Library, Cambridge, England; Royal Polytechnic Society, Cornwall, England; Philosophical and Library Society, Leeds, England; Zoölogical Society, Meteorological Office, Linnean Society London, England; Natural History and Antiquarian Society, Penzance, England; Université Laval, Quebec, Canada; Nova Scotia Institute of Science, Halifax; Agricultural Experiment Station, Bangor, Me.; Massachusetts Institute of Technology, American Philological Association, Massachusetts Historical Society, Capt. J. W. Norcross, Miss Cornelius Horsford, Boston, Mass.; Astronomical Observatory of Harvard College, Museum of Comparative Zoölogy, Cambridge, Mass.; Essex Institute, Salem, Mass.; Rhode Island Historical Society, Providence; Connecticut Historical Society, Hartford; Yale University, American Oriental Society, New Haven, Conn.; Albany Institute, Albany, N. Y.; Buffalo Library, Buffalo, N. Y.; Hamilton College, Clinton, N. Y.; Academy of Sciences, Meteorological Observatory, American Geographical Society,

Profs. J. A. Allen, Isaac H. Hall, Mr. Cortlandt F. Bishop, New York, N. Y.; Mr. William John Potts, Camden, N. J.; Free Public Library, Jersey City, N. J.; American Chemical Society, Easton, Pa.; Pennsylvania State Weather Service, Zoölogical Society, Pennsylvania Hospital, Prof. George F. Barker, Dr. D. G. Brinton, Prof. E. D. Cope, Messrs. Herbert Welsh, Joseph Wilcox, Philadelphia; Peabody Institute, Baltimore, Md.; Departments of Labor, Agriculture, U. S. National Museum, Messrs. J. W. Fewkes, Lester F. Ward, Washington, D. C.; Leander McCormick Observatory, Charlottsville, Va.; Virginia Historical Society, Richmond; Agricultural Experiment Station, Raleigh, N. C.; Col. Charles C. Jones, Augusta, Ga.; Geological Survey of Arkansas, Little Rock; Agricultural Experiment Station, Knoxville, Tenn.; Geological Survey of Texas, Austin; University of California, Berkeley; Mercantile Library Association, San Francisco, Cal.; University of Cincinnati; Archæological and Historical Society, Columbus, O.; Academy of Natural Sciences, Davenport, Ia.; Washburn College, Topeka, Kans.; Observatorio Astronomico N. de Tacubaya, Chapultipec, Mex.; Direccion Général de Estadistica, Mexico, Mex.; Direccion General de Estadistica, Guatemala, C. A.; Observatoria N. Arjentino, Buenos Aires, S. A.; Museo Nacional, Santiago de Chile, S. A.

The following donations to the Cabinet were received:

A photo-lithographic copy of the certificate of membership of the American Philosophical Society of Robert Strettle Jones, presented by his grandson, Robert J. Fisher, Washington, D. C.

A phototype (framed) of the old "Liberty Bell," presented by Mr. F. Gutekunst, Philadelphia.

Photographs for the Society's Album were received from Dr. Isaac H. Hall, New York; Mr. Henry C. Baird, Dr. Charles A. Oliver, Philadelphia; Dr. F. A. Muhlenberg, Reading, Pa.

The following deaths were announced:

Anthony J. Drexel (Philadelphia), died June 30, 1893, æt. 60.

Col. C. C. Jones (Augusta, Ga.), died July 19, 1893, æt. 62.

Robert Cornelius (Philadelphia), died August 10, 1893, æt. 84.

Prof. William H. C. Bartlett (Yonkers, N.Y.), died May 11, 1893.

The President was authorized to appoint a suitable person to prepare the usual obituary notice of Mr. Cornelius.

List of deficiencies, part third, was laid before the Society.

The University of Missouri wrote that its Library had been destroyed by fire, and requesting that certain of the Society's Proceedings should be replaced.

On motion the matter was referred to the Librarian with power to act.

And the Society was adjourned by the presiding member.

Stated Meeting, September 15, 1893.

Prof. ALBERT H. SMYTH in the Chair.

Letters of acknowledgment were received from the Observatoire Phys. Central de Russie, St. Petersburg (139); Taschkent Observatory, Taschkent, Turkestan (139); Societas pro Fauna et Flora Fennica, Helsingfors, Finland (136–138); K. Norske Videnskabernes Selskab, Throndhjem, Norway (139); K. Universitetet, Lund, Sweden (139); K. Svenska Vetenskaps Akademien, Stockholm, Sweden (140); Société Royale de Géographie, Antwerp, Belgium (139); K. Zoologisch Genootschap "Natura Artis Magistra," Amsterdam, Netherlands (140); Colonial Museum, Fondation de P. Teyler vander Hulst, Harlem, Holland (139, 140); K. Bibleotheek, The Hague, Holland (139, 140); K. K. Sternwarte, Prag, Bohemia (139, 140); Anthropologische Gesellschaft (137, 138); K. K. Central Anstalt für Meteorologie und Erdmagnetismus (140); Profs. Friederich Müller (140), Gustav Tschermak (136–139), Vienna, Austria; K. Preuss. Geol. Landesanstalt und Bergakademie,

Berlin (140); Verein für Schlesische Insektenkunde, Breslau, Prussia (139); Verein für Geographie u. Statistik, Frankfurt a.-M. (138, 139); Geographische Gesellschaft, Hannover, Prussia (139); K. Sächsische Gesellschaft der Wissenschaften, Prof. J. Victor Carus, Leipzig, Saxony (139, 140); Verein der Freunde der Naturgeschichte, Mecklenburg, Germany (139); K. Sternwarte, Munich, Bavaria (140); Verein für Vaterländische Naturkunde in Würtemberg, Stuttgart (136–139, and Trans., xvii, 1, 2); Prof. Carl Vogt, Geneva, Switzerland (140); Biblioteca N. C., Florence, Italy (139); R. Accademia dei Lincei (140); Prof. G. Sergi, Rome, Italy (139, 140); Osservatorio Astronomico, Académie R. des Sciences, Turin, Italy (139); Société d'Émulation, Abbeville, France (140); Société Linnéenne, Bordeaux, France (140); Société d'Anthropologie (135, 138, 139), Ministerè des Travaux Publics (140), Marquis de Nadaillac, Profs. Hovelacque, Moscart, Mospero, Paris, France (140); University Library, Prof. J. P. Postgate, Cambridge, England (140); Philosophical and Literary Society, Leeds, England (140); Royal Society, Victoria Institute, R. Meteorological Society, Society of Antiquaries, R. Geographical Society, Linnean Society, Mr. C. Juhlin Dannfeld, London, England (140); Literary and Philosophical Society, Manchester, England (140); Natural History Society, Newcastle-upon-Tyne, England (140); Radcliffe Observatory, Sir H. W. Acland, Oxford, England (140); Royal Society of Edinburgh, Scotland (140); Mr. Horatio Hale, Clinton, Ontario, Canada (140); New York State Library, Albany (135–140); Geological Society of America, Rochester, N. Y. (140); Prof. George Stuart, Philadelphia (136, 137, 139); Dr. W. H. Appleton, Swarthmore, Pa. (137–140); Philosophical Society, Washington, D. C. (140); State Agricultural College, Michigan (139, 140); Kansas State Agricultural College, Manhattan (139); Bishop Crescencio Carrillo, Mérida de Yucatan, Mexico (139, 140); Central Meteorological Observatory, Mexico (140).

Letters of acknowledgment (141) were received from the Geological Survey of Canada, Ottawa; Historical and Scientific Society, Winnipeg, Manitoba; Bowdoin College, Bruns-

wick, Me.; Maine Historical Society, Society of Natural History, Portland, Me.; Prof. C. H. Hitchcock, Hanover, N. H.; Vermont Historical Society, Montpelier; State Library of Massachusetts, Boston Society of Natural History, Massachusetts Historical Society, Athenæum, Marine Biological Laboratory, Prof. T. M. Drown, Mr. Robert C. Winthrop, Boston, Mass.; Harvard College, Museum of Comparative Zoölogy, Profs. A. Agassiz, G. L. Goodale, Mr. Robert N. Toppan, Cambridge, Mass.; Free Public Library, New Bedford, Mass.; Essex Institute, Salem, Mass.; Prof. Elihu Thomson, Swampscott, Mass.; Ames Antiquarian Society, Worcester, Mass.; Agricultural Experiment Station, Kingston, R. I.; Providence Franklin Society, Rhode Island Historical Society, Providence; Connecticut Historical Society, Hartford; Yale University, New Haven Colony Historical Society, New Haven, Conn.; Agricultural Experiment Station, Storrs, Conn.; New York State Library, Albany, N. Y.; Society of Natural Science, Buffalo, N. Y.; Prof. Edward North, Clinton, N. Y.; Profs. J. M. Hart, J. W. Oliver, B. G. Wilder, Ithaca, N. Y.; Meteorological Observatory, Ames Museum Natural History, Ames Geographical Society, Historical Society, Profs. Isaac H. Hall, John J. Stevenson, New York; Vassar Brothers' Institute, Poughkeepsie, N. Y.; Geological Society of America, Rochester, N. Y.; Prof. W. Le Conte Stevens, Troy, N. Y.; Oneida Historical Society, Utica, N. Y.; Free Public Library, Jersey City, N. J.; Historical Society, Newark, N. J.; Prof. Charles A. Young, Princeton, N. J.; Prof. H. D. Gregory, Philadelphia; Agricultural Experiment Station, Newark, Del.

Donations to the Library were announced.

Mr. W. P. Tatham presented to the Society, on the behalf of Mrs. Mifflin Wistar, a handsomely bound collection of letters to the late Dr. Caspar Wistar, accompanied by the following letter:

TO THE PRESIDENT AND MANAGERS OF
THE AMERICAN PHILOSOPHICAL SOCIETY.

Gentlemen:—The Manuscripts described in the accompanying list have

been selected from the papers of Prof. Caspar Wistar, M.D., who was the fourth President of your ancient and honorable Society.

Among them are letters in English, in French, in German, and in Latin, from some of the most learned men of science of their day. The direct information that they convey may be of little value; it is not from writings of the early years of this century that we look for scientific instruction. But some of the letters are from men so eminent, that they cannot fail to be of interest both in what they tell us of their authors, and in the history of scientific discovery. And the fact that Dr. Wistar's talents were so honored, and his friendship so valued by great and learned men in distant countries, at a period in our history when America attracted little attention among the nations of the earth, will perhaps be gratifying to his successors in this Society, and to American scholars in general.

I beg of you to accept these letters as a memorial of Prof. Wistar's son, my late husband, Dr. Mifflin Wistar, who inherited a love of his profession and a love of his fellow-men, and who died in 1872. No descendant of Prof. Wistar now survives.

I am, gentlemen, most respectfully yours,

ESTHER F. WISTAR.

September, 1893.

*The following is a catalog of the letters, etc., presented:

1. Geneva, July 19, 1794. Letter from Dr. Sylvestre to Dr. Caspar Wistar. (French.)
2. Charleston, May 20, 1796. De Beauvoir to Dr. Wistar, proposing a scientific journey in Georgia.
3. Richmond, April 25, 1798. Same to same, describing the discovery of a skeleton of an elk in Virginia. (French.)
4. North Carolina, May 13, 1797. Letter from Rev. Samuel Spring and Samuel McCorkle to Robert Patterson.
5. New York, February 14, 1792. From Dr. Samuel L. Mitchell to Dr. Wistar, describing a new invention of distilling fresh water from salt.
6. New York, June 30, 1798. Same to Jonathan Williams, describing geological discoveries in New York.
7. Boston, October 12, 1799. Notice of Dr. Wistar's election to the Historical Society of Massachusetts.
8. Paris, April 3, 1801. Printed Prospectus of a work of G. Cuvier, on Quadrupeds, received by the American Philosophical Society from the author.
9. Washington, Mississippi Territory, August 24, 1805. Letter from Samuel Brown to Thomas Jefferson, President of the United States, describing discovery of large bones.
10. Paris, November 15, 1807. Letter from Dr. Delile to Dr. Wistar, relating to poison of the Upas Tree. (French.)
11. Paris, November 24, 1808. Same to same, informing Dr. Wistar that the writer is engaged in a work on the Flora of Egypt, at the Government's expense. (French.)
12. Dissertation on Upas poison, referred to in No. 10. (French.)
13. Paris, October 21, 1809. Letter from Dr. Delile to Dr. Wistar, sending the said dissertation. (French.)
14. Paris, September 14, 1810. Same to same. (French.)
15. Paris, October 10, 1808. Report of G. Cuvier to the Institut National, Classe des Sciences, Physiques et Mathematiques, on a collection of fossils sent by Jefferson. (French.)
16. Paris, November 14, 1808. Letter of thanks for the above from Cuvier to Jefferson. (French.)

On motion, the sincere thanks of the Society were tendered to Mrs. Mifflin Wistar for her valuable gift, for which the Society ordered suitable acknowledgment should be made.

The deaths of Edward Hopper, August 7, 1893, æt. 82, and John M. Maisch, September 10, 1893, æt. 63, were announced, and the President authorized to appoint suitable persons to prepare the usual obituary notices.*

Mr. Lyman read a paper on "The Great Mesozoic Fault in

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17. Paris, May 27, 1809. Letter from Andre Michaux to Dr. Wistar, referring among other things to his work. (French.)

18. Paris, November 29, 1809. Same to same. (French.)

19. Paris, September 7, 1810. Same to same, introducing Monsieur Borges. (French.)

20. Paris, December 5, 1811. Same to same, introducing the Abbe de Correa de Serra. (French.)

21. Paris, January 28, 1812. Same to same. (French.)

22. Paris, June 26, 1814. Same to same. (French.)

23. Paris, September 17, 1816. Same to same. (French.)

24. Paris, December 18, 1817. Same to same. (French.)

25. No date. Same to same. (French.)

26. No date. Same to same, sending the first volume of Michaux's book on the trees of the United States.

27. No date. Instructions from the American Philosophical Society to Mr. Andrew Michaux, for exploring the country along the Missouri and thence westwardly to the Pacific Ocean.

28. Francker (Holland), July 31, 1809. Letter from A. G. Camper about fossils collected by his father, the late Professor of Anatomy, Pitrus Camper.

29. Francker, November 10, 1809. From same to Dr. Wistar, about same, etc.

30. Francker, June 2, 1815. From same about same, etc.

31. Francker, June 20, 1816. From same to Dr. Wistar, about an alligator skeleton, etc.

32. Paris, December 4, 1811. From D. B. Warden to Dr. Wistar, introducing Correa de Serra.

33. Boston, September 27, 1813. From I. Correa de Serra to Dr. Wistar.

34. Lexington, August 20, 1814. From same to same.

35. St. Petersburg, October, 1813. From Dr. Tilesius to Dr. Wistar, about skeletons, etc. (Latin.)

36. St. Petersburg, October, 1813. From same to same, about fossils, skeletons, etc.

37. St. Petersburg, January 27, 1814. From same to same, accompanying a box of casts of skulls, bones, etc. (German.)

38. New York, May 1, 1815. Notice of Dr. Wistar's election as an honorary member of the New York Literary and Philosophical Society.

39. Bethlehem, June 2, 1816. Letter from John Heckewelder to Dr. Wistar, about the publication of a book, etc.

40. Bethlehem, July 4, 1816. From same to same, about said book.

41. Bethlehem, April 26, 1817. From same to same.

42. March 3, 1815. Report of the Committee on Dr. Wistar's Memoir on the Othmoid Bone.

43. January 19, ——. Report of the Committee on Dr. Wistar's Paper on Fossil Bones.

44. Philadelphia, July 22, 1830. Letter from the President of the American Philosophical Society, asking for the loan of Dr. Wistar's portrait in order to have it copied and hung in the Hall of the Society.

* The President subsequently appointed Dr. Charles S. Dolley for Dr. Maisch.

New Jersey," after the conclusion of which the author, in answer to a query by Mr. Williams as to whether he could suggest any other name for the Newark group, stated that Montgomery shales would be more suitable, because the beds occur more fully and have been studied more thoroughly in Montgomery county (Pennsylvania) than in any other like district; but that the beds are probably of two various ages to be properly called by a single name.

New nominations Nos. 1260, 1261, 1262, 1263, 1264 were read.

Mr. Williams moved "that a Committee of five members be appointed to consider a plan for preparing a Coöperative Index of all Transactions."

After discussion, the motion was deferred until the next meeting of the Society, notice of same to be placed on the card, and the Society was adjourned by the presiding member.

Stated Meeting, October 6, 1893.

President FRALEY in the Chair.

Correspondence was submitted as follows:

A letter from Hon. Charles P. Daly, New York, accepting membership.

A letter from the Naturhistorische Verein der Preussischen Rheinlande, Westfalens und des Regierungs-Bezirks Osnabrück, Bonn, Prussia, inviting the Society to attend the celebration of its Fiftieth Anniversary, held May 23 and 24, 1893.

A letter from the Niederrheinische Gesellschaft für Natur- und Heilkunde, Bonn, Prussia, inviting the Society to attend the celebration of its Seventy-fifth Anniversary, held July 2, 1893.

Letters of envoy were received from the K. Akademie der Wissenschaften, Vienna, Austria; Naturforschende Gesellschaft, Bamberg, Bavaria; K. Geologische Landesanstalt und

Bergakademie, K. P. Meteorologische Institut, Berlin, Prussia; Verein für Schlesische Insektenkunde, Breslau, Prussia; K. Sächsische Gesellschaft der Wissenschaften, Leipzig, Saxony; Verein für Vaterländische Naturkunde, Stuttgart, Würtemberg; Société des Sciences Physiques et Naturelles, Bordeaux, France; Musée Guimet, Paris, France; Smithsonian Institution, Washington, D. C.; Mr. William John Potts, Camden, N. J.; Academy of Natural Sciences, Davenport, Iowa; Dirección General de Estadistica de la República Mexicana, Mexico.

Letters of acknowledgment were received from the Royal Society of Victoria, Melbourne (139); Royal Society of N. S. Wales, Sydney, Australia (139); K. Vetenskaps Akademiens, Stockholm, Sweden (141); Royal Society of Sciences, Upsal, Sweden (140); K. Danske Videnskabernes Selskab, Prof. Japetus Steenstrup, Copenhagen, Denmark (139, 140); Royal Zoölogical Society, Amsterdam, Netherlands (139); K. Zoolisch-Botanische Genootschap, The Hague, Z. Holland (139, 140); Imperial Academy of Science, St. Petersburg, Russia (139); K. K. Naturhistorische Hofmuseum, Drs. Aristides Brezina, Friederich S. Krauss, Matthæus Much, Vienna, Austria (140); Naturforschende Gesellschaft des Osterlandes, Altenberg, Saxe-Weimar (140); Deutsche Geologische Gesellschaft (139, 140), Editor of *Naturwissenschaftliche Wochenschrift* (140), Gesellschaft für Erdkunde (140), Berlin, Prussia; Verein für Erdkunde, Dresden, Saxony (140); Physikalisch-Medicinische Societät, Erlangen, Bavaria (139, 140); Oberhessische Gesellschaft für Natur- und Heilkunde, Giessen, Hesse (139, 140); Physikalisch-Œkonomische Gesellschaft, Königsberg, Prussia (139); Verein für Erdkunde, Metz, Lorraine (139, 140); Instituto di Studi Superiori, Firenze, Italia (140); R. Osservatorio dell' Università, Torino, Italia (140); Académie des Sciences et Belles-lettres, Angers, France (139); Société Historique du Cher, Bourges, France (139); Société des Sciences Naturelles et Archéologiques de la Creuse, Guéret, France (139); Prof. León de Rosny, Paris, France (139); Mr. Samuel Timmins, Arley, Coventry, England (141); Bath

and West and Southern Counties Society, Bath, England (140, 141); Royal Meteorological Society (141), Victoria Institute (141), Linnean Society (141), Royal Astronomical Society (141, and Trans., xvii, 3, xviii, 1), Prof. William Crookes (141), Mr. C. Juhlin-Dannfelt (141), Dr. W. H. Flower (140), London, England; Literary and Philosophical Society, Geographical Society, Manchester, England (141); Royal Observatory, Edinburgh, Scotland (141, and Trans., xvii, 3, xviii, 1); Massachusetts Agricultural College, Amherst (141), Dr. Justin Winsor, Cambridge, Mass. (137–140); Prof. James Hall, Albany, N. Y. (141); American Geographical Society, Prof. Isaac H. Hall, New York (137–140); Prof. C. W. Shields, Princeton, N. J. (141); Wyoming Historical and Geological Society, Wilkesbarre, Pa. (141); State Library of Pennsylvania, Harrisburg, Pa. (Trans., xvii, 3, xviii, 1); Mercantile Library (141), Prof. E. D. Cope (141), Mr. E. T. D'Invilliers (137–140), Mr. G. de B. Keim (141), Prof. Albert H. Smyth (141), Prof. George Stuart (135, 141), Philadelphia; Prof. James E. Rhoads, Bryn Mawr (137–141); Agricultural Experiment Station, Newark, Del. (139, 140); U. S. Naval Institute, Annapolis, Md. (141); Maryland Institute, Enoch Pratt Free Library, Baltimore, Md. (141); Mr. T. L. Patterson, Cumberland, Md. (141); Smithsonian Institution (544 packages), Bureau of Ethnology, Surgeon-General's Office, U. S. Weather Bureau (Trans., xvii, 3, xviii, 1), Anthropological Society, U. S. Coast and Geodetic Survey, U. S. Geological Survey, Col. Garrick Mallery, Rt. Rev. John J. Keane, Profs. S. F. Emmons, Charles A. Schott, Drs. J. S. Billings, Albert S. Gatschet, W. J. Hoffmann, Mr. W. B. Taylor, Washington, D.C. (141); University of Virginia, Leander McCormick Observatory, Charlottsville, Va. (141); U. S. Artillery, Fort Monroe, Va. (141); Prof. J. W. Mallet, University of Virginia, Va. (141); N. C. Experiment Station, Raleigh (141); Canebrake Experiment Station, Uniontown, Ala. (141); University of Alabama, University P. O. (141); State Experiment Station, Baton Rouge, La. (141); Academy of Sciences, Austin, Texas (141); Society of Natural History, Prof. T. H.

Norton, Cincinnati, Ohio (141); Oberlin College, Oberlin, O. (141); Agricultural Experiment Station, Knoxville, Tenn. (141); Purdue Experiment Station, LaFayette, Ind. (141); State Agricultural College, Michigan (141); Academy of Natural Sciences, Davenport, Ia. (141); Washburn College, Topeka, Kans. (141); State Historical Society, Madison, Wis. (141); Colorado Scientific Society, Denver (141); State Agricultural College, Fort Collins, Colo. (137, 139, 140, 141); Academy of Science, Tacoma, Wash. (141); Experiment Station, Lincoln, Neb. (141); University of California, Prof. Joseph LeConte, Berkeley, Cal. (141); Prof. J. C. Branner, Palo Alto, Cal. (141); Prof. Daniel Kirkwood, Riverside, Cal. (141); Prof. George Davidson, San Francisco, Cal. (141); Obseratorio Astronomico de Tacubaya, Mexico (141); Bishop Crescencio Carrillo, Merida, Yucatan, Mex. (141).

Accessions to the Library were reported from the K. K. Militär-Geographische Institut, Vienna, Austria; Naturforschende Gesellschaft, Bamberg, Bavaria; K. P. Meteorologische Institut, Berlin, Prussia; Verein für Erdkunde, Cassel, Prussia; Naturforschende Gesellschaft, Emden, Prussia; Oberhessische Gesellschaft für Natur- und Heilkunde, Giessen, Hesse; Geographische Gesellschaft, Hanover, Prussia; Physikalisch-Œkonomische Gesellschaft, Königsberg, Prussia; Verein für Kunst und Alterthum, Ulm, Würtemberg; Société des Sciences Physiques et Naturelles, Bordeaux, France; Académie N. des Sciences, etc., Caen, France; Société de l'Histoire de France, Prof. Paul Topinard, Paris, France; Société d'Agriculture, Lyons, France; Instituto y Osservatorio de Marina, San Fernando, Spain; Société de Geographie, Lisbon, Portugal; Rousdon Observatory, Devon, England; Department of Public Works and Mining, Halifax, N. S.; Natural History Society, Montreal, Canada; Royal Society of Canada, Ottawa; Massachusetts Institute of Technology, Boston, Mass.; Scientific Alliance, Prof. J. A. Allen, New York, N. Y.; Mr. Henry Phillips, Jr., Philadelphia; Smithsonian Institution, Anthropological Society, Dr. Elliott Coues, Washington, D. C.; Georgia Historical Society, Savannah; Public Library, St.

Louis, Mo.; Michigan Mining School, Lansing; University of Wisconsin, Madison; Mr. Alton H. Thompson, Topeka, Kans.; Nebraska State Historical Society, Lincoln; Colorado Scientific Society, Denver; Agricultural Experiment Stations, Kingston, R. I., Madison, Wis.

A photograph for the Society's album was received from Mr. Robert P. Field, Philadelphia.

A circular from the Friesch Genootschap voor Geschied-, Ondheid en Taalkunde, Leeuwarden, Friesland, announcing the death of three of its members.

The Secretaries reported that the paper by Prof. Gentry was undesirable for publication, and it was ordered to be returned to its writer.

Dr. Ruschenberger read an obituary notice of the late William Barton Rogers.

Prof. W. B. Scott, of Princeton, N. J., presented a paper for the Transactions entitled, "On the Mammalian Fauna from the Deep River Beds of Montana," of which he gave an oral synopsis.

On motion, the President was authorized to appoint a Committee of three members to examine and report on same.*

Dr. Brinton read a paper on "The Central American Native Calendar."

In answer to a query by Dr. Morris, Dr. Brinton made some remarks on the meaning of the Mexican Calendar.

Pending nominations Nos. 1260, 1261, 1262, 1263 and 1264 were read.

At the call of deferred business, the motion of Mr. Williams, offered at the last meeting, was taken up and considered. The motion was as follows:

"*Resolved*, That a Committee of five members be appointed to consider a plan for preparing a Coöperative Index of all Transactions."

The subject was discussed by Messrs. Smyth, Brinton, Cope, Prime, Phillips, Morris and others, and was explained by Mr. Williams.

* Dr. Cope, Dr. Ryder and Mr. Lyman were subsequently appointed as such Committee.

Dr. Horn moved to amend the resolution so that it should read as follows: "*Resolved*, That a Committee of five members be appointed to consider the expediency of preparing a plan of a Coöperative Index of all Transactions and if expedient to report such a plan to the Society."

Mr. Williams accepted the amendment.

The question was put on the motion as amended and the resolution was carried by a vote of seven ayes to six nays.

And the Society was adjourned by the President.

Stated Meeting, October 20, 1893.

President, Mr. FRALEY, in the Chair.

Dr. James E. Rhoads, of Bryn Mawr, was presented to the Chair and took his seat.

Accessions to the Library were reported from the Government Geologist, Adelaide, Australia; R. Societatis Scientiarum, Upsal, Sweden; Naturwissenschaften Verein des Reg.-Bez. Frankfurt a. O., Prussia; Direzione Generale della Statistica, Rome, Italy; R. Accademia de Scienze, R. Osservatorio Astronomico, Turin, Italy; Union Géographique du Nord de la France, Douai; Société de Géographie, Paris, France; Geological Survey of Canada, Ottawa; Historical and Scientific Society of Manitoba, Winnipeg; Vassar Brothers' Institute, Poughkeepsie, N. Y.; Ferry Co., Hoboken, N. J.; Mr. Henry Phillips, Jr., Philadelphia; Board of Public Charities, etc., Harrisburg, Pa.; Surgeon-General's Office, Bureau of American Republics, Dr. Albert S. Gatschet, Washington, D. C.; Public Library, Cincinnati, O.; Iowa Geological Survey, Des Moines; Department de Fomento, Caracas, Venezuela.

Letters of envoy were received from the Société Royale des

Sciences, Upsal, Sweden; Académie R. des Sciences, etc., Bruxelles, Belgium; Geological Survey of Canada, Ottawa; Bureau of American Republics, Washington, D. C.

Letters of acknowledgment were received from the Royal Geographical Society (Queensland Branch), Brisbane (139); Société Royale des Sciences, Upsal, Sweden (125–139); K. Zoologisch Genootschap, Amsterdam, Netherlands (141); Fondation de P. Teyler van der Hulst, Colonial Museum, Haarlem, Holland (141); Museum van Oudheiden, Leiden, Holland (141); Royal Library, K. Zoologisch-Botanisch Genootschap, 'S-Gravenhage, The Hague (141); Académe R. des Sciences, etc., Bruxelles, Belgium (139); K. K. Central-Anstalt für Meteorologie, etc., Vienna, Austria (141); Naturhistorische Verein, Bonn, Prussia (139); Naturwissenschaftliche Verein des Reg.-Bez. Frankfurt a. O., Prussia (137, 139, 140); Direktion der Deutsche Seewarte, Hamburg, Germany (140); K. Sternwarte, Munich, Bavaria (141); Marquis Antonio de Gregorio, Palermo, Italy (139, 140); Philosophical Society, Cambridge, England (141, and Trans., xvii, 3, xviii, 1); Royal Geographical Society, Zoölogical Society, Dr. W. H. Flower, Mr. P. L. Sclater, London, England (141); Prof. W. Boyd Dawkins, Manchester, England (139, 140, 141); Natural History Society, New-Castle-on-Tyne, England (141); Royal Society, Dublin, Ireland (141); Prof. W. D. Whitney, New Haven, Conn. (141); Prof. L. B. Hall, Haverford, Pa. (141); Dr. John H. Brinton, Philadelphia (141); Smithsonian Institution, Washington, D. C. (141); University of Michigan, Ann Arbor, Mich. (141); Prof. E. W. Claypole, Akron, O. (141); Cincinnati Observatory (141); Prof. H. S. Osborn, Oxford, O. (141); Prof. J. L. Campbell, Crawfordsville, Ind. (141); Mr. Everard F. im Thurn, Georgetown, British Guiana, South America (140); Bureau de Statistique, La Plata, Buénos Ayres, South America (96, 107–128, 135–138).

The Committee on Prof. W. B. Scott's Paper reported the same to be worthy of publication in the Transactions of the Society.

On motion, the Committee was discharged.

Pending nominations Nos. 1260, 1261, 1262, 1263 and 1264 were read, spoken to and balloted for.

Mr. Prime made some remarks on the classification of ore deposits and proposed a new system.

Dr. Cope made an oral communication on the forms of fossil sharks, family Cladodontidæ.

The President reported the appointment of Mr. William P. Tatham on the Committee of Finance in place of W. B. Rogers, deceased.

The business of the meeting being over, the Tellers examined the ballots cast and reported to the President the state of the poll.

The President thereupon declared that the following had been duly elected to membership in the Society:

2222. Dr. Samuel A. Green, Boston, Mass.
2223. Dr. John G. Morris, Baltimore, Md.
2224. Prof. J. M. Hoppin, New Haven, Conn.
2225. Chevalier Rousseau d'Hoppancourt, Vienna, Austria.
2226. Dr. Isaac Roberts, London, England.

And the Society was adjourned by the President.

A Notice of William Barton Rogers.

By W. S. W. Ruschenberger, M.D.

(*Read before the American Philosophical Society, Oct. 6, 1893.*)

According to its long-existing practice on the death of a member, the Society, at the proper time, resolved that a notice of the late William B. Rogers should be recorded in its *Proceedings*, and that the President should appoint a member to prepare it. He has been pleased to kindly assign the duty to me. And now, with diffidence, I submit the following brief sketch.

Mr. Rogers was a son of Dr. James Blythe Rogers, who succeeded

the distinguished chemist, Dr. Robert Hare, in the Professorship of Chemistry in the University of Pennsylvania. His three uncles, as well as their father, Dr. P. K. Rogers, were widely known in the field of science. Dr. P. K. Rogers was appointed, in 1819, Professor of Natural Philosophy and Mathematics in the ancient college of William and Mary, at Williamsburg, Va. William B. Rogers, the uncle after whom our subject was named, was Professor of Natural Philosophy and Geology in the University of Virginia, and, from July, 1835, the Director of the Geological Survey of the State. Henry Darwin Rogers was Director of the First Geological Survey of Pennsylvania, and, from 1858, Regius Professor of Natural History in the University of Glasgow; and Dr. Robert E. Rogers was Professor of Chemistry during many years in the University of Pennsylvania, and subsequently in the Jefferson Medical College.

William B. Rogers, Jr., was born Dec. 17, 1833, in Baltimore, where his parents then resided. In 1840, they settled in Philadelphia. William was first at a Friends' School, taught by Miss Mary Tyson. On leaving it, he was, from 1843 to 1846, at the Public Grammar School, N.E. corner of Twelfth and Locust streets, of which Mr. Clevenger was Principal.

In 1846, he entered the Central High School of Philadelphia, then under the direction of Mr. John S. Hart, and graduated Bachelor of Arts in 1850. The same year he matriculated at the University of Virginia, but being called home in the spring of 1852 by the illness of his father, who died June 15, he did not resume his course in the University.

In the winter of 1852–53, he was appointed an assistant on the First Geological Survey of Pennsylvania, and for three years did field or office duty, as occasion required, and in the fourth year, desultory work. This Geological Survey was ended by the failure of the Legislature of the State to appropriate money to continue it, and all who had assisted in the work were released from their connection with it.

Mr. Rogers was without regular occupation during many months. To him profitable and continued employment of some kind was very desirable. He was always an earnest student, and his acquirements were notable at that time. It seemed probable that the example of the lives of his father and uncles, as well as his own preference, would induce him to select for himself only some one of

the vocations associated with science. Possibly, however, observation may have satisfied him that toiling on any purely scientific path does not always lead to sufficient compensation, reckoned either in fortune or in fame. Whatever reason may have determined his course, he abandoned science as a career, but adhered to it as a proper diversion and amusement for leisure hours.*

In December, 1859, The Western Saving Fund Society of Philadelphia appointed him a clerk in the institution. There his habitual exactness, devotion to duty, pleasant demeanor, and manifest integrity in every sense won for him unreserved confidence and esteem, and secured his advancement step by step in the institution. In July, 1862, he was promoted to be Secretary and assistant of the President.

He married, Nov. 12, 1862, a daughter of Mr. William Wynne Wister, of Germantown, and in December of that year was appointed Treasurer of the Saving Fund. He was chosen Vice-President of it in February, 1878, and elected one of the Board of Managers of the Society in October, 1882.

To obtain temporary relaxation from official duty after almost continuous attention to it during thirty-one years, and also for the benefit of his health, which was in some degree impaired, he went to Europe in June, 1890; and, having visited the British Islands, Belgium, France, Germany and Switzerland, returned and resumed his official work, after an absence of about three months.

His educational training and impressions, received while in view of near relatives engaged in scientific work, possibly imparted the taste which led him to seek temporary diversion from cares incident to his vocational occupation in certain societies, devoted to the increase and diffusion of knowledge, as well as to the promotion of general interest in intellectual pursuits. He was interested in several such associations.

Mr. Rogers became a member of the Union League, May 13, 1863, and resigned from it Nov. 13, 1866.

He was a member of the Academy of Natural Sciences of Philadelphia from September, 1870, and was elected one of the Board of Trustees of the Building Fund of the Academy, and Secretary of the Board in January, 1893.

* The writer of this notice learned since "reading" it, that Mr. Rogers, about three months before his death, told a friend that the reason why he abandoned science for finance was his inability to obtain any scientific appointment.

He was a member of the Board of Directors of the Mercantile Library Company of Philadelphia from 1878 till 1887, when he resigned.

He was chosen a member of the American Philosophical Society April 16, 1880, and served on its Finance Committee from January, 1885.

He was elected a member of the Historical Society of Pennsylvania, December 19, 1887; and was also a member of the Geographical and of the Photographical Societies.

The titles of the institutions in which Mr. Rogers was interested may suggest the various subjects that, at different times, occupied his attention. Intellectually liberal, generous in disposition, and naturally endowed with a well-balanced mind—good sense—his diversified and reliable knowledge greatly enhanced his qualifications to be an efficient officer and manager in a financial institution.

His general health had become impaired in the past year. After a few hours' illness at his home in Germantown, he died on the evening of March 15, 1893, in the sixtieth year of his age, leaving a widow, a son, and a daughter, bereaved of a considerate, loving husband and affectionate father.

The Western Saving Fund Society of Philadelphia, at a special meeting, March 20, recorded on its minutes an expression of its sense of loss in the death of its Vice-President, who with entire approbation had served the Society during thirty-three years. His extensive knowledge of finance enabled him to judiciously select securities suitable for the investment of funds entrusted to the care of the Society. He had the confidence and respect of depositors; and with those who desired to transact other business with the institution, his relations were always friendly and confidential.

The value of an officer so highly qualified cannot be easily estimated nor definitely expressed. William B. Rogers will long be kindly and respectfully remembered by his daily associates and numerous friends.

Philadelphia, in his death, lost a modest, intelligent, unpretentious citizen, whose conduct was exemplary in every respect—a man who never forgot to do his duty.

PROC. AMER. PHILOS. SOC. XXXI. 142. 2 G. PRINTED NOV. 15, 1893.

The Native Calendar of Central America and Mexico.

A Study in Linguistics and Symbolism.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, Oct. 6, 1893.*)

§ 1. Purpose and Method of the Inquiry.
§ 2. Geographic Extension of the Calendar System.
§ 3. Mathematical Basis of the Calendar. The 20 and 13-day Periods.
§ 4. The 5-day Periods and "Year-bearers."
§ 5. The 7-day Periods.
§ 6. The Vague Solar Year.
§ 7. Methods of Divination by the Calendar.
§ 8. Calendar Festivals of the Modern Quichés.
§ 9. Where was the Calendar Invented, and by what Nation?
§ 10. The Linguistic Analysis.
§ 11. Analysis of the Day-Names in the Mayá, Tzental, Quiché, and Cakchiquel Dialects, and in the Zapotec and Nahuatl Languages.
§ 12. Analysis of the Month-Names in the Maya, Tzental, Quiché, and Cakchiquel Dialects, and in the Chapanec Language.
§ 13. The Symbolism of the Day-Names.
§ 14. General Symbolic Significance of the Calendar.

§ 1. Purpose and Method of this Inquiry.

Of all the intellectual monuments which remain to us of the native race of the Western Continent, the most remarkable without doubt is the Calendar system which was in use among the more civilized tribes of Mexico and Central America. Years ago, Alexander von Humboldt assigned to it the first rank among the proofs that they had reached a certain degree of true civilization; indeed, so deeply did its intricacies impress him, that he could not believe that it was wholly developed by tribes so uncultured in some other respects, and sought for its chief principles an origin among the old civilizations of Asia.*

A profounder study of the subject, rendered possible by more abundant documents, especially of a linguistic character, has shown that the hypothesis of the great naturalist is unnecessary,

*See his *Vues des Cordillères et Monumens des Peuples Indigènes de l'Amérique*, Tome 1, p. 332, etc.

and indeed contrary to the evidence. The peculiarities which mark this Calendar belong to itself alone, and differ completely from those on which the time-counts and astronomical measurements of the ancient nations of the Old World were based. It is strangely and absolutely independent and American in its origin and development.

The especial object which I have in view in this essay is to collect the month and day-names of all the nations of the Maya stock within my reach, and subject them to an etymological analysis and comparison with their correspondents in the Zapotec and Nahuatl tongues, and to endeavor to reach the symbolic significance of the Calendar as a mythical record and method of divination.

I confine myself to the linguistic analysis, and avoid that based on the hieroglyphic writing, of which so much use has been made by Prof. Cyrus Thomas, Dr. Schellhas, Dr. Seler and others, because I believe it must be brought into requisition with great caution and under strict limitations. The leading principle of this writing is, in my opinion, essentially phonetic, and not representative; but phonetic according to what I have called the "ikonomatic" method, which means that the glyph or figure is a picture, not of the object, but of the name of the object, as in what is called a "rebus."*

The consequence of this is, that it becomes quite misleading to seek the real meaning or derivation of a day-name or other word from the figure which represents it in the hieroglyphic writing. The latter stands usually for a word of an entirely different meaning, the only connection being a more or less similarity in sound.

This will readily be understood by a few examples of this method of writing in our own tongue. In it, for instance, the pronoun "I" would be represented by the picture of an eye; a (writing) pen by the picture of a (hog) pen; "matron" by a mat, and a person running; and so on.

It is evident that any attempt to derive from such figures the literal names of the day or month would lead the inquirer wholly astray. Yet in spite of the fact that we have any number of examples proving that this method was constantly in use by the

*See my *Essays of an Americanist*, pp. 213–229 (Philadelphia, 1890), for a full explanation of the ikonomatic method.

Nahuas and Mayas, the authors above referred to and others have repeatedly overlooked it, and have often been led into obviously erroneous interpretations.

§ 2. Geographic Extension of the Calendar System.

We know to a certainty that essentially the same Calendar system was in use among the Nahuas of the Valley of Mexico and other tribes of the same linguistic family resident in Tlascallan and Meztitlan, in Soconusco, Guatemala and Nicaragua; that it prevailed among the Mixtecs and Zapotecs; and that of the numerous Mayan tribes, it was familiar to the Mayas proper of Yucatan, the Tzentals and Zotzils of Chiapas, the Quichés and Cakchiquels of Guatemala, and to their ancestors, the builders of the ruined cities of Copan and Palenque.

There is no direct evidence that it had extended to the Huastecas, of Maya lineage, on the Rio Panuco; but it was in vogue among the Totonacos, their neighbors to the south, on the Gulf of Mexico. The Pirindas, Matlazincas and Tarascos of Michoacan had also accepted it, though perhaps not in a complete form.* The Chapanecs (Chiapanecs) or Mangues, part of whom lived in Nicaragua and part in Chiapas, had also adopted it.

The tribes above named belong to seven entirely different linguistic stocks, but were not geographically distant. Outside of the area which they occupied, no traces of this Calendar system, with its many and salient peculiarities, have been found, either in the New or the Old World.

The date of this wide dispersion we cannot assign, but we can positively say that it was many centuries before the conquest of the country by the Spaniards. We know that in the Mayan territory the builders of the ancient cities of Palenque in Tabasco, and Copan in Honduras, both of which had been deserted and ruined long before the arrival of Cortes, were familiar with a well-developed form of this Calendar, and with the graphic methods for carrying out its computations. We further know that the migrations of the Nahuas from Central Mexico, to form the colonies of the Pipiles in Guatemala, and of the Nicaraos in Nicaragua, took place after that stock had elaborated their special

* On this point, consult the *Anales del Museo Michoacano*, Tomo I (1888), p. 85, for a critical exposition of the question, by the Rev. Paso y Troncoso. Also, Orozco y Berra, *Historia Antigua de Mexico*, Tomo II, p. 144 *et seq.*

form of the Calendar, because these emigrants carried it with them, and preserved it until the advent of the Europeans. Such facts incline us to accept the statement of the Quiché astronomers to the effect that they had been regularly keeping their national annals by this time measurement for at least eight hundred years before the advent of the Spaniards in 1524. *

The Mayan dialects of which I can avail myself are the Maya proper of Yucatan; the Tzental of Chiapas; and the Quiché and Cakchiquel of Guatemala. The last two differ very slightly from each other, and may be considered as one language. The Tzentals and Zotzils were closely allied branches of the stock, who inhabited a considerable portion of Chiapas and Tabasco when this region was first explored by the Spaniards. Early writers often call the Tzentals, "Tzendals" and "Zeldals," through a corruption of their proper name, which is Tzental, there being no *d* in their alphabet. The Zotzils called themselves Keren, "young men," which the Spaniards changed into Quelenes.

Garcia de Palacio, writing in 1576, includes both under the compound name, Zeldal-Quelen, as one language.† They have from time to time been spoken of erroneously as Chiapanecs. These, whose right name is Chapanecs, are linguistically in no way related to the Mayan stock.

The Tzental dialect is not distant from the pure Maya. In his scheme of the divarication of the stock, Dr. Stoll places it, indeed, as the branch nearest allied to the tongue spoken in Yucatan.‡ I am inclined, however, from my own studies of these dialects, to accept as correct the uniform traditions of the Cakchiquels, Quichés and Tzutuhils of Guatemala, who traced their ancestry to the same parentage as that of the Tzentals and Zotzils; thus bringing the dialects of Chiapas into closer relationship to those of Guatemala than to those of the Peninsula of Yucatan. §

* "Demas de ochocientos años," Herrera, *Historia de las Indias Occidentales*, Dec. iii, Lib. iv, cap. 18.

† *Carta al Rey*, p. 20 (Ed. Squier).

‡ Dr. Otto Stoll, *Ethnographie der Republik Guatemala*, s. 84 (Zurich, 1884). The form "Tzotzil" adopted by this writer is not so correct as "Zotzil."

§ I do not include the Chol among the proper dialects of the Tzental territory. It is of modern introduction, from the upper valley of the Usumacinta river.

§ 3. Mathematical Basis of the Calendar.

The general outlines of this Calendar system are so well known —or rather, I should say, are discussed in so many accessible books—that I need not more than refer to them here.

The basis is a so-called "month" of 20 days. Each day is designated by a name of some object, animate or inanimate; and besides its name, each day is numbered, but not from 1 to 20, but only from 1 to 13, when the numbering begins again at the unit.

The result of this combination evidently is, that a day bearing both the same name and the same number will not recur until 13 of the "months" have elapsed. This gives a period or cycle of 260 days, and this anomalous period is at the foundation of the native Calendar.

Why was it chosen? Does it correspond to any series of recurring events in nature? Is it astronomical? Or was it purely mythical and terrestrial?

The answers to these inquiries are not entirely satisfactory. It is generally admitted that the number 20 was chosen because the arithmetical system of these nations was vigesimal, and grouping the days by twenties was a natural method with them; and it has usually been stated that the number 13 represents one-half the number of days during which the moon is visible between its heliacal conjunctions, and that it owed its selection to this observation.*

An obvious difficulty in this theory is, that according to it the Calendar ought not to take note of the days when the moon is in conjunction, as otherwise after the very first month it will no longer correspond with the sequence of natural events from which it is assumed to be derived; but as these days *are* counted, it would appear, although the lunar relations of the calendar in later days cannot be denied, that it had some other origin.

The month may have been counted from new moon to new moon; but the 26 days in which the moon was actually visible alone have been included in a ritual or ceremonial lunar count, 13 of these being assigned to the waxing, 13 to the waning moon.

* See Orozco y Berra, *Historia Antigua de Mexico*, Tome II, p. 12. Another theory which he suggests is that the 13 may have had reference to the 13 lunar months which approximately make up a solar year.

Dr. Förstemann is of opinion that the 13-day period arose from an effort to divide the vague solar year, counted as 364 days, into equal parts, thus making $13 \times 28 = 364$. *

Another theory, especially urged by the able Mexican antiquary, Paso y Troncoso, is that the period of 260 days and the number 13 owe their selection to astronomical observations of the planet Venus. He points out that 5 synodical revolutions of Venus equal 8 solar years; and that after 13 periods of 8 years, forming a cycle of 104 years, on the initial day of the next cycle the relative positions of Venus and the sun would be the same as at the commencement of the first cycle.†

An entirely different explanation of the selection of the number 13 is that which traces it to certain widespread terrestrial and mythical connections.

Whether these mythical relations were adopted from the Calendar or whether they gave rise to it, they certainly were present in marked prominence among these nations. According to Aztec mythology the heavens were 13 in number, and 13 divinities ruled over the under world. The Quichés and Cakchiquels believed that 13 was the number of the first ancestors of the human race, so they divided their tribes into 13 divisions or gentes. And other instances could be quoted of the sacredness of this number.

Whence did it derive this mythical character?

A possible explanation has been suggested to me by Mr. Frank H. Cushing, based on his observations among the Zuñis.

In the ceremonies of this nation the complete terrestrial sphere is symbolized by pointing or blowing the smoke to the four cardinal points, to the zenith and the nadir, the individual himself making the seventh number. When the celestial is also to be symbolized only the six directions are added to this seven, because the individual remains the same. So that the number typifying the whole universe, terrestrial and celestial, becomes 13.

When, on the other hand, in their ceremonies the rite requires the officiant to typify the supra- and the infra-terrestrial spheres,

* "Die Zahl 364 scheint den Anlass gegeben zu haben das Jahr in Perioden von je 13 Tagen zu teilen. Denn die Natur scheint die Zahl 13 nicht geliefert zu haben." *Globus*, Bd. 63, No. 2. 1892.

† See his lengthy and careful study in the *Anales del Museo Nacional de Mexico*, Tomo ii, pp. 350, *seq.*

that is, the upper and the under worlds, the same number, 13, results, as it is held that in each the sun stands for the individual, being in turn the day-sun and the night-sun, the light and the dark sun, but ever the same, and therefore counts but once.

The number 13 possesses certain properties and relations which appear to have recommended it widely for divinatory purposes and games. The Mexican "cycle" was composed of 52 years arranged in 4 series of 13 each; precisely analogous to a pack of our playing cards. These cards can be traced back to primitive games played for purposes of divination; and no doubt the numbers were selected and combined in both instances from the same motives.

The Nahuas certainly regarded the ritual year of 260 days as equivalent to 9 lunations, as they divided it in some of the most important of their Calendars—the celebrated "Tonalamatl," for instance—into 9 equal divisions, ruled over by the so-called 9 "Lords of the Night;" thus $29 \times 9 = 261$; though what they did with the supernumerary day is not clear.*

An ingenious theory of the mathematical development of this Calendar has been offered by Mrs. Zelia Nuttall. It assumes that at the close of each period of $20 \times 13 = 260$ days, 5 intercalary days were inserted before the next 260-day period was technically commenced. This naturally brought its commencement on the next subsequent Dominical day, and also caused the whole period, 265 days, to equal, very nearly, nine lunations. If it can be shown that this intercalation actually took place, Mrs. Nuttall's suggestion will have cleared up one of the most obscure problems in American archæology.

It seems inherently probable that there was some such very accurate hieratic plan of keeping the time count, as we are assured by many writers that certain native festivals, etc., were observed precisely on days of the year fixed by the European Calendar.†

*On the Tonalamatl see Dr. Seler's very thorough article in the *Compte-Rendu* of the Congress of Americanists for 1888, p. 527, *seq.*

† Dr. Stoll has shown that the Cakchiquels must have *subtracted* 3 days from the 260 in order to keep their reckoning as we know they did. (*Ethnologie der Indianerstämme von Guatemala*, p. 66. Leiden, 1889.) His comparison of the methods of reckoning time among the Nahuas, Mayas and the nations of Guatemala is highly suggestive.

§ 4. The 5-day Periods and "Year-bearers."

The sequence of the days is found to be the same in all the Calendars which have been preserved, from whatever stock they have been derived. In all, also, the "month" of 20 days was divided into a series of 4 shorter periods of 5 days each. But here the similarity ends, for these 5-day periods did not uniformly begin on the day which we know was the first of the 20, nor was there any agreement between the various Calendars as to when they should begin. As the counts of the years and cycles were named after and adjusted by these "Dominical days," or, as the Mayas called them, "Year-bearers," this led to a certain confusion.

The differences will be seen in the following table, in which the numbers are those of the 20-day period on which the shorter periods of 5 days began in the several Calendars.

Maya.	Tzental.	Quiché-Cakchiquel.	Zapotec.	Nahuatl
4	3	2	1	3
9	8	7	6	8
14	13	12	11	13
19	18	17	16	18

It will be seen that the only two which agree are the Tzental and the Nahuatl; and the only one which began the 5-day and the 20-day periods on the same day was the Zapotec.

Nevertheless, the fact that the Calendar did begin on the first day of the 20-day period was distinctly recognized by these peoples. It is mentioned concerning the Mayas by Bishop Landa,* and by various writers of the Mexicans. Why and when the change was made remains extremely obscure and has received a variety of explanations at the hands of students.

Orozco y Berra questioned the accuracy of Landa's statement, that the day *Imix* began the count in Maya, and suggested that what his informant meant was, that the day and number of *Imix* were duplicated every four years as a bissextile day, and in that sense began the reckoning.†

Dr. Seler explains the Nahuatl and Maya Dominical days thus: "The day *Acatl*, like *Kan*, belongs to the four chief signs with which the sequence of the years is indicated, and both refer

* Landa, *Relacion de las Cosas de Yucatan*, p. 246.
† *Historia Antigua de Mexico*, Tom. ii, p. 128.

especially to those years which are assigned to the East, the place of beginning."* This does not explain why these days rather than others were chosen as the "Year-bearers," or as the Dominical days. Nor is it accurate to say that the Calendars, when arranged, as was the custom, with reference to the cardinal points, began at the east. Motilinia tells us those of the Nahuas, at least those which he had seen, began with *Tochtli*, which was placed to the south;† and Ordonez y Aguiar, in the scheme of the Tzental Calendar, which he copied from a native original, begins with *Lambat*, which he also places to the south;‡ both of these being the eighth day of these calendars.

According to Dr. Förstemann, who has prosecuted such valuable researches into the Maya Codices, the Maya years began with *Imix* until towards the close of the fifteenth or the beginning of the sixteenth century, when the lack of an intercalary day led to a disorder in the reckoning. They then intercalated 17 days, and recommenced the regular account with *Kan*. He is of opinion that the Codex Troano shows the older form of reckoning, the Codex Dresdensis the newer.§

In some correspondence I have had with Prof. Cyrus Thomas, who has given long and fruitful attention to the study of the Maya Codices, he states his entire agreement with Dr. Förstemann that the Dresden Codex "follows the usual method of counting by the four-year series as the *Kan*, *Muluc*, *Ix* and *Cauac* years." As to the statement of Bishop Landa, Dr. Thomas writes me: "As we find several of the time series in the Codices commencing with this day (*Imix*), it is probable that the Indians in explaining to Landa hit on one of these, thus causing him to believe this to be a rule in counting years."

M. de Charencey believes that the Aztecs chose the third day of the series, the Mayas the fourth day, etc., with which to begin the count, because these numbers were specially sacred in these various nations from mythical associations or historic incidents. ‖

* *Zeitschrift für Ethnologie*, 1888, p. 42.

† *Historia de las Indias de la Nueva España*, Trat. i.

‡ *Historia del Cielo y de la Tierra*, MS. This singular work is now in a private library in the United States.

§ See his article, "Zur Maya Chronologie," in the *Zeitschrift für Ethnologie*, 1891, pp. 141, *sqq.*

‖ Charencey, *Des Nombres Symboliques chez les Tolteques Occidentaux*, p. 19 (1893).

None of the above solutions can be deemed satisfactory. The fact remains, that among all these peoples the first day of the 20-day series was well known and recognized as such; and yet, except among the Zapotecs, it was not used as a Dominical day or a year-bearer. The Nahuas were well aware of this curious discrepancy, and had their own explanation of it, which, of course, is either purely mythical, or so esoteric that its interpretation escapes us. They said that the 5-day periods and the years did originally begin with day 1 and number 1 (*ce Cipactli*), and that this continued from the time of the invention of the Calendar down to the close of the fourth age of the world, a period of 2028 years; but as the fifth or present age began on the 8th day of the series and number 1 (*ce Tochtli*), this was then chosen in place of the former. * This 8th day was therefore placed on the south of the "wheel," and as the count was from right to left, it necessarily brought the 13th day, *Acatl*, to the east, and therefore the true series of Dominical days in the Aztec Calendar would run thus: 8 : 13 : 18 : 3.

Making this correction in this and the other Calendars, we obtain the following as the true sequence of the year-bearers in them, the numbers showing the position of the days in the 20-day series.

Maya.	Tzental.	Quiché-Cak.	Zapotec.	Nahuatl.
4. Kan.	8. Lambat.	17. Noh.	1. Chilla.	8. Tochtli.
9. Muluc.	13. Ben.	2. Ig.	6. Lana.	13. Acatl.
14. Ix.	18. Chinax.	7. Queh.	11. Goloo.	18. Tecpatl.
19. Cauac.	3. Votan.	12. E.	16. Guilloo.	3. Calli.

Here again the Tzental is in accord with the Nahuatl, which diminishes the probability of it being a mere coincidence.

§ 5. The 7-day Period.

The Tzentals appear to have developed the number 7 as an arithmetical element in their astronomical system. They had in their Calendars 7 days painted with black figures, the first be-

* See the discussion of the Nahuatl myths on the subject, by Paso y Troncoso, in the *Anales del Museo Nacional de Mexico*, Tom. ii, p. 351 *et seq.*, and Orozco y Berra, *Historia Antigua de Mexico*, Tom. i, p. 17. According to Ixtlilxochitl, the Tezcucans did not begin with *Tochtli*, but with *Tecpatl*, the latter being the date of the destruction of Tollan. This would give still another series: 18 : 3 : 8 : 13.

ginning with a Friday.* It is not possible from the jejune account we have of this feature to say whether it was based on the European week, or was the result of the subtraction of the 13 days of the native week from the 20 days of the month.

I am inclined to the latter view; for the Tzentals were not the only nation employing this Calendar who had a 7-day period, although Orozco y Berra, in discussing the subject, asserts that they were.† We have, however, the testimony of Father Thomas Coto to the fact that the Cakchiquels of Guatemala had a period of similar length in their time count, though unfortunately he took so little interest in the subject that he mentions nothing beyond the bare fact.‡ And Father Varea, writing of the same nation, says that they observed a period of 7 days annually in Lent, during which they believed all animals, etc., retired into seclusion. To this period they gave the name *K'api k'ih*, closed days or days apart, the same term which they applied to the intercalary days. §

The close relation of the 7 period to the 13 period is shown in the traditional history of the Cakchiquels. From the earliest times they were divided into 13 divisions, *K'hob*, and 7 tribes, *Amag'*. These were undoubtedly drawn from the numbers of the Calendar. ‖

The attention of the native arithmeticians was naturally attracted to the number 7, as in order to know the number of the day in the 13-day list on which a given month would commence, they were obliged to add 7 to the number of the first day of the preceding month. This was the foundation of a series of tables preserved in several of the Maya "Books of Chilan Balam," bearing the title *Buk Xoc*, or General Computation, specimens of which have been given by Pio Perez.¶

*"En muchos pueblos de las provincias de este obispado tienen pintados en sus reportorios o kalendarios siete negritos para hacer divinaciones y pronosticos correspondientes á los siete dias de la semana, comenzandola por el Viernes á contar." Nuñez de la Vega, *Constituciones Diocesanas del Obispado de Chiappa*, Lib. i, p. 9.

†Orozco y Berra, *Historia Antigua de Mexico*, Tom. ii, p. 160.

‡"Algunos meses duran veinte dias, y otros siete; que ni los acabaremos de entender, ni ellos se entienden, aunque tienen sus maestros en esta facultad." Thomas Coto, *Vocabulario de la Lengua Cakchiquel*, MS., 1651.

§"*K'api kih:* Siete dias que suelen caer en la quaresma, en los quales dicen los indios que se recogen todos los animales, montes, etc." Varea, *Vocabulario Cakchiquel*, MS.

‖ *Annals of the Cakchiquels, passim.*

¶ In his Essay on the Maya Calendar, printed in the *Registro Yucateco* and in Brasseur's edition of Diego de Landa's *Relacion*.

Dr. Forstemann brings evidence to show that the Mayas at one time arranged the days of the solar year in 4 groups of 7 weeks each, each week being the native one of 13 days ($4 \times 13 \times 7 = 364$), and that each of these groups of 7 was assigned to a particular cardinal point.*

§ 6. The Vague Solar Year.

Whatever might have been its origin or earlier uses, this period of 260 days was no longer at the time of the Conquest the received civil time measure, but was confined to divinatory, astrological and sacred purposes. It served to fix the festivals and fasts of religion, and to foretell the fate of individuals and nations.

No doubt these nations, like the northern hunting tribes, had in early times a rude and inaccurate method of noting the solar year, either by seasons, or lunations, or by the regular recurrence of natural phenomena. An effort was made to adjust to this the computation by vigesimal day periods, 18 of which gave 360 days. This still required 5 days every year and 1 more every 4 years to render the count accurate. The 5 days were noted, and annually allowed for as "useless," or uncounted days; but the 1 every 4 years, which we intercalate in our leap year, was probably not recognized in most tribes, and several careful authors think not anywhere. The assertions in reference to this by early authorities are obscure and unsatisfactory.

In spite of the fact that these 20-day periods in no wise corresponded to the lunar months nor were derived from them, they seem to have been very generally called by terms connected with the word for moon, which indicates that at some time they superseded a more ancient system of reckoning the solar year by a series of lunations.

This will be seen from the following examples:

The Cakchiquels, according to Varea, had two expressions for "month," the one, *iq*, evidently allied to *iq*, moon; the other, *atit*, the literal meaning of which is "old woman" (muger

* *Globus*, No. 2, 1892. The Nahuatl legend of the "Seven Caves, Chicomoztoc," whence issued their ancestors, and the repeated use of the number seven in the *Popol Vuh*, are other indications of the general sacredness of this number among the tribes under discussion. I have already quoted Mr. Cushing in reference to its meaning in the mythical rites of the Zuñis.

vieja). The Mayas spoke of the 20-day period as *u*, the moon or lunar month. The Tzentals employed the corresponding term *i*, moon or month, and for year the word *avil* from the same root as the Maya *haab*.

There was no uniformity in the date of beginning the solar year. The Mayas were said to have begun it on July 16, the Cakchiquels on January 31, and as for the Quichés, three authorities before me, Ximenes, Gavarrete and a native Calendar, assign respectively February 27, December 24 and February 7. The same uncertainty prevailed everywhere.

§ 7. Methods of Divination by the Calendar.

A study of the methods of divination by the Calendar as employed by these nations would be by no means profitless. To them, this use of it was far more important than as a time count. Man's fears and hopes, all the emotions which prompt his actions, look to the future rather than to the past; and for that reason prophets, when accredited, have ever enjoyed greater popular consideration than historians. We may be reasonably sure that the key to the few ancient Calendars which have been preserved to us, and also to the strange inscriptions on the ruined buildings of Central America, is to be found in astrology rather than in chronology.

The only early writer who enters into this with any degree of fullness is Father Sahagun, who devotes the fourth book of his "History of New Spain" to the judicial astrology of the ancient Mexicans.* Writing a hundred and fifty years later, Bishop Nuñez de la Vega, of the Diocese of Chiápas, states explicitly that the general principles then in use for soothsaying from the Calendar in that district were the same as those practiced in Mexico from the remotest known period;† and that they have

* The information on this subject supplied by Father Duran in his *Historia de las Indias de Nueva España*, Tom. ii, App. Cap. ii, is, according to his own statements, of doubtful correctness.

† "En cada successo escogian un Dios; y llegó cada uno a tener su *nagual*, y aun muchos, uno solo de astros, elementos, aves, pezes, y brutos animales, y algunos tan viles, y asquerosos, como hormigas, ratones, lechuzas y murcielagos. Este error fué passando y arraigandose tanto en los subsequentes *Nagualistas*, que hasta oi en dia se ha practicado por Reportorios y Kalendarios del primitivo gentilismo, que en la substancia y modo de pronosticar por el numero de 20 y de 13, concuerdan los mas modernos con los mas antiguos, que se practicavan en Mexico; y solo en los nombres significado por los 20 caracteres en cada provincia son diversos, ó por ser differente los idiomas, ó por no ser unos mismos los que poblaron." Nuñez de la Vega, *Constituciones Diocesanas*, Lib. ii, p. 134 (Roma, 1702).

not materially differed down to the present day, is proved by a native Quiché Calendar of 1854, which I have in my possession.

The decisions of the native astrologers as to which days are auspicious or the reverse did not seem to depend on any theories transmitted from nation to nation; although in the Calendars of a given nation there was a prevailing consensus of opinion among them. Thus, Sahagun remarks of the Mexican repertories, "In general, in all the signs, the tenth and thirteenth days are good," while "the eighth and ninth days are usually bad."* It is consistent with this that we find the 9th days of all the signs chosen by malicious witches and sorcerers as those on which they would be most active in their evil designs.† The same number, 9, appears to have had some special meaning for the Quiché diviners, as in each of their months they had 9 good and 9 bad days, the remaining 2 being indifferent.‡ The Aztecs had 6 good days, 7 indifferent and 7 bad. §

The painted paper or skin on which the Calendar was represented by its symbols was taken as a ground on which lots were cast, and as they fell on one or other of the signs, they betokened a fortunate or unfavorable outcome of an undertaking.‖

But it was especially to foretell the fate of a new-born child and to select his guardian spirit or *nagual*, that the Calendar was chiefly called in by the priesthood.¶ One name of a child was that of the day of its birth, both the number and the day name being expressed. This gives us those curious personal appellations often recurring in the early Spanish historians, such as Seven Winds, Five Serpents, and the like. Wherever they occur, we may be sure the nation made use of this Calendar.

§ 8. Calendar Festivals of the Modern Quichés.

The natives of Guatemala of aboriginal blood continue to reckon by this ancient Calendar, and regulate by it certain recurrent festivals and rites which have little to do with the Christi-

* Sahagun, *Historia de Nueva España*, Lib. iv, Cap. ii, 16.

† Orozco y Berra, *Historia Antigua de Mexico*, Tom. ii, p. 24.

‡ See Scherzer, *Die Indianer Santa Catalina Istlavacan*, p. 15.

§ Diego Duran, *Historia de las Indias*, Tom. ii, p. 259, who names them.

‖ Duran, *ubi suprá*, p. 259.

¶ Father Juan de Cordova, who is our only authority for the Zapotec Calendar, explains at length its employment in divination, *Arte de la Lengua Zapoteca*, p. 201, *seq.* I do not extend my remarks on this subject, as I shall examine it fully in an article on "Nagualism," as it prevailed before and after the Conquest among these peoples.

anity to which they are ostensibly adherents. A writer of that country has furnished a description of these, and as the publication in which his article appeared is extremely rare,* and the facts pertinent, I shall quote some of them.

When a day name coincides with the number 8, the day is considered sacred and a rite is celebrated either of the first, second or third order of solemnity, according to its object, for instance:

The day 8 *Camey* is that on which the souls of the departed are prayed for, and the sorcerers implored to keep evil-minded souls from injuring the living.

The day 8 *Kanel* was that on which in ancient times they sacrificed to the divinities of the field and of agriculture. At present, Saint Anthony occupies the place of the dethroned old gods, and to him they offer the first fruits and dance to the sound of the marimba.

On the day 8 *Batz*, which by their count falls in the last month of their year,† there is a sort of general summary of all the festivals of the year, when there is much dancing, much copal burned as incense, much discharge of rockets, the whole closing with a general intoxication of the participants on aguardiente.

The day 8 *Ee* is that devoted to the adjuration of a particular monkey, who is supposed to be seated on one of the hill-tops, and is therefore called "The God of the Hill" (Dios del Cerro). The native priests require numerous offerings from the faithful to placate him, which naturally find their way into their own stores.

The day 8 *Ah-mak*, like *Camey*, is set apart to commemorate the dead. The native priests go forth in the evening and call upon them with loud voices, while the mourners tell the spirits thus summoned whatever family news or other incidents they think will interest them.

On the day 8 *Noh* is celebrated a festival dedicated to the house and the family. They call upon the names of their deceased ancestors and place upon the altar which is invariably set up a cup of water in which a piece of money is dropped, which piece will be handed the cura of the parish the next day

* H. Spina in *Boletin de la Sociedad Economica de Guatemala*, Dec., 1870.

† The Calendar to which this refers evidently, like that of the Cakchiquels, drops 3 of the 260 days; otherwise, 8 Batz would not always fall in the last month.

to pay for masses for the dead.* A curious feature of the invocations on this day is one to their navel strings, which, at birth, are buried within or close to the house. This recalls an ancient Mexican superstition. †

§ 9. Where was the Calendar Invented, and by What Nation?

The comparison I institute throughout the different nations which adopted this Calendar of the names of the 20 days which make up the month, and those of the 18 months which make up the solar year, proves beyond doubt that the former are translations from some one original source, while the latter are almost entirely different in the different nations, and represent, therefore, later developments of the astrological Calendar, and various adaptations of it to the solar years of the several nations.

This fact leads the way to an important historical inquiry: To which one of the many linguistic stocks employing this Calendar must we assign the original form and meaning of the names of the days? Whichever it is, to it we must also assign the first invention of this strange and intricate system which has played so important a part in the development of Mexican and Central American art, thought and religion.

Most of the older authors who credulously accepted the fables of the natives, and those of later date who follow in their footsteps, join in attributing the Calendar to the "Toltecs," who are imagined to have been a mighty people, of high culture, whose "empire" extended far and wide in southern Mexico and Central America. In another publication I have given abundant reasons to disprove this ancient story, and to reduce the Toltecs to the inhabitants of the small town of Tula, north of the city of Mexico.‡

* Another name for this day is *gua rabalhá*, which I suppose to refer to this ceremony, and to be a compound of *gua*, fountain, spring; *r*, his or its; *balih*, to fill; *há*, house; "the water that supplies the house," or something to that effect.

† At birth, the Nahuas buried the navel string (and placenta) with important ceremonies, as they believed its disposition influenced the after-life of the child. If it was a boy, an arrow and a shield were interred with it, that he might be brave; if a girl, a *metate* and corn-roller were substituted, that she might make a diligent house-wife. See the Codex Mendoza in Kingsborough's *Mexico*, Vol. v, p. 91, and Sahagun, *Historia*, Lib. v, Appendix.

‡ See the article entitled "The Toltecs and their Fabulous Empire," in my *Essays of an Americanist* (Philadelphia, 1890).

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Quite different is the opinion of more recent and able archæologists.

In a work published in 1880 the historian of Mexico, Manuel Orozco y Berra, stated that, "without any doubt," the Calendar of the Zapotecs of Oaxaca was the original on which were based and from which were developed all the other Calendars of Mexico and Central America which had as their fundamental relations the periods of 13 and 20 days. He founded this conclusion, not on linguistic grounds, but on the more ancient and primitive character of the Calendar as preserved by the Zapotecs.*

In 1890, consequently ten years later, Dr. E. Seler expressed a similar belief that the Zapotecs were the probable inventors of the Calendar, his reasons being chiefly linguistic and archæological.†

I frankly acknowledge that after carefully weighing all the evidence brought forward by these writers, and much more from my own researches, I have been unable to reach any definite decision on this question; though from various minor indications I think the probability is in favor of the opinion that it was the invention of that ancient branch of the Mayan stock who inhabited the present States of Chiapas and Tabasco, and left still visible proofs of their remarkable culture in the ruins of Ocozingo and Palenque.

In the relics from these ancient cities we find a development of art unequaled elsewhere on the American continent; and to this region the admirable analysis of Mayan antiquities by Dr. Schellhas inevitably points,‡ as the scene of the definite beginnings of that stock's remarkable cultural evolution.

I have discovered no conclusive or even weighty evidence that we should look to the Zapotecs as the discoverers of the Calendar system; but I am far from denying the possibility that it may hereafter be adduced. It must be borne in mind, however, that we lack the material for studying the Calendar as

* Orozco y Berra, *Historia Antigua de Mexico*, Tomo ii, cap. 1 (Mexico, 1880). M. Eugene Boban, in his *Catalogue de la Collection Goupil* (Paris, 1892), quotes and directs attention to Orozco's opinion.

† In the *Zeitschrift für Ethnologie* (Berlin, 1891), and in the *Compte Rendu* of the Seventh Congress of Americanists, p. 735 (Berlin, 1890). I have not observed that he refers to the priority of Orozco y Berra in defending this opinion.

‡ See his article, "Vergleichende Studien auf dem Felde der Maya-Alterthümer," in the *Internationales Archiv für Ethnographie*, Bd. iii, 1890.

it was employed by the Mixtecs, a tribe of antique and developed culture, who had employed it for an indefinite period;* and are equally ignorant of its form and names among the Totonacos, who put forth the claim that they themselves had invented it, and had constructed the celebrated pyramids of the sun and moon on the plain of Teotihuacan as a permanent memorial of it.†

The period of 20 days is characteristic of this Calendar; and wherever in America we find the solar year divided into periods of this duration, we may be sure that the local Calendar is based on this ancient divinatory scheme. So far as I know, this does not occur outside of Mexico and Central America. The Peruvians divided their year into lunar months, and the Muyscas or Chibchas of Colombia, although, like the Cakchiquels of Guatemala, they had a year cycle of 20 years, measured each year by 12 months of 30 days each. In the Old World no similar combination of 20 and 13 in a time-count has come to my knowledge.

§ 10. The Linguistic Analysis.

All who have made a study of this Calendar have appreciated the importance of a close etymological analysis of the names of the days and months. It was, as regards the Nahuatl, attempted by Boturini in the last century and more successfully by those versed in that language at the present day—but still leaving much to be desired.

In the Maya, Don J. Pio Perez paid considerable attention to these etymologies, and so also have Dr. P. Schellhas and Dr. Ed. Seler in Germany.‡ They have left, however, many gaps to fill, principally from their defective resources in a lexicographic appa-

* There are said to be one or two Calendars extant, as yet unpublished, of Mixtec origin. That this nation had a "month" of 20 days bearing the same names as those of their neighbors is evident from the statements in Herrera, *Hist. de las Indias*, Dec. iii, Lib. iii, cap. xiv, and Garcia, *Origèn de los Indios*, Lib. v, cap. iv. These give the day names, Wind, Snake, Deer, Monkey, Tiger, Rose, etc.

† Torquemada, *Monarquia Indiana*, Lib. iii, cap. 18. According to the same authority, the first king of the Totonacos bore the name Ome Acatl, 2 Reed, which, if true, proves their knowledge of the Calendar at that time.

‡ Pio Perez's translations may be found in various publications, especially in Brasseur's edition of Landa's *Relacion de las Cosas de Yucatan*. Dr. Schellhas' analysis is in the *Zeitschrift für Ethnologie*, 1886, p. 19, *seq.*, and Dr. Seler's in the same periodical, 1888.

ratus for the Mayan stock. In this respect I am more fortunately situated, having access to a number of unpublished vocabularies in the Library of the American Philosophical Society and in my own collection. These include, for the Maya proper, the MS. dictionaries obtained from the convents of Motul and San Francisco, Yucatan, and named from them; for the Tzental the vocabulary of Father Domingo Lara,* and for the Quiché and Cakchiquel the MS. vocabularies of Fathers Varea, Coto, Guzman, Ximenes and Villacañas. For the Zapotec I have depended on an anonymous vocabulary in MS., the published works of the licentiate Belmar, the grammar of Father Juan de Cordova and the *Vocabulario Hispano-Zapoteco* recently issued in the city of Mexico. The Nahuatl is easily accessible through the dictionaries of Molina and Siméon.

With these at hand, I believe I am able to show beyond question:

1. That the day-names in all five of these languages and dialects are substantially identical in signification, and therefore must have had one and the same origin.

2. That in all the Mayan dialects the names belonged already at the time of the Conquest to an archaic form of speech, indicating that they were derived from some common ancient stock, not one from the other, and that, with one or two possible exceptions, they belong to the stock and are not borrowed words. On the other hand, none of the Nahuatl day-names are archaic, which appears to indicate that these received the Calendar at a later date.

3. That the theory of Boturini, subsequently espoused by the Abbé Brasseur and others, that the day-names refer to historic characters, is wholly without foundation.

4. That there is no evidence to connect them with astronomical bodies or processes, but that they seem purely divinatory and mythical.

*This is the writer called by the Abbé Brasseur in his *Bibliothèque Mexico-Guatémalienne*, p. 10, "Ara," and the MSS. he describes are those now in my hands, two in number, copied in 1616 and 1620. Father Lara was provincial of Chiapas in 1556. See Beristain y Souza, *Biblioteca Hispano-Americana Setentrional*, Tom. ii, p. 132.

§ 11. Analysis of the Day-Names.

List of the Usual Day-Names in the Maya, Tzental and Quiché-Cakchiquel Dialects, and in the Zapotec and Nahuatl Languages (the Dominical days in small capitals).

	Maya.	Tzental.	Qul.-Cak.	Zapotec.	Nahuatl.
1.	Imix,	Imox,	Imox,	Chilla,	Cipactli.
2.	Ik,	Igh,	Ik,	Gui, Ni, Laa,	Ehecatl.
3.	Akbal,	Votan,	Akbal,	Guèla,	Calli.
4.	Kan,	Ghanan,	Kat,	Guache,	Cuetzpallin.
5.	Chic chan,	Abagh,	Can,	Zii,	Cohuatl.
6.	Cimi,	Tox,	Camey,	Lana,	Miquiztli.
7.	Manik,	Moxic,	Queh,	China,	Mazatl.
8.	Lamat,	Lambat,	Canel,	Lapa,	Tochtli.
9.	Muluc,	Molo,	Toh,	Niza,	Atl.
10.	Oc,	Elab,	Tzi,	Tella,	Itzcuintli.
11.	Chuen,	Batz,	Batz,	Goloo,	Ozomatli.
12.	Eb,	Euob,	Ee,	Pija,	Malinalli.
13.	Ben,	Been,	Ah,	Quii,	Acatl.
14.	Hix,	Hix,	Balam,	Eche,	Ocelotl.
15.	Men,	Tziquin,	Tziquin,	Naa,	Quauhtli.
16.	Cib,	Chabin,	Ah mak,	Loo,	Cozcaquauhtli.
17.	Caban,	Chic,	Noh,	Xoo,	Ollin.
18.	Edznab,	Chinax,	Tihax,	Goppa,	Tecpatl.
19.	Cauac,	Cahogh,	Cooc,	Appe,	Quiahiutl.
20.	Ahau,	Aghaual,	Hunahpu,	Lao,	Xochitl.

The First Day.

1. Maya, *imix;* 2. Tzental, *imox* or *mox;* 3. Quiché-Cak., *imox* or *moxin;* 4. Zapotec, *chilla* or *chiylla;* 5. Nahuatl, *cipactli.*

It is evident that the three Maya dialects have the same word. Pio Perez regarded it as a transposition of *ixim*, maize, while Dr. Seler, following Dr. Schellhas, derives it from the root *im*, a teat or udder, both conveying an idea of fruitfulness.*

The occurrence of *mox* in Tzental, and *moxin* in Quiché-Cak. (the latter given by Ximenes in his *Vocabulario Cakchiquel*, MS.), shows, however, that the radical syllable is not *im*, but *m-x*. This leads me to identify it with the Maya *mex* or *meex*, which is the name of a fish (the " pez arana," " un pescado que tiene

* The figure of a mamma, which represents this day in some of the drawings, is merely ikonomatic. This representation is noted by Dr. Schellhas, *Zeitschrift für Ethnologie*, 1886, p. 22.

muchos brazos"), probably so called from another meaning of *mex*, the beard, often used metaphorically, as *u mex kin*, the rays (beard) of the sun (*Diccionario de San Francisco*, MS.) The change of the vowel, in *mex* to *mix*, is not unusual in Maya. Pio Perez in his *Dictionary* gives, for instance, the old form *benel* to modern *binel*, *pem* to *pim*, etc.

On the other hand, we find in various dialects of the Maya the *i* retained in the word for "beard;" as Huasteca, *itzim;* Chaneabal, *itzimal;* Zotzil, *isim*, etc.; thus proving the identity of the two forms.

This identification brings this day name into direct relation to the Zapotec and Nahuatl names for the first of the Calendar. In the former *chiylla*, sometimes given as *pi-chilla*, is apparently from *bi-chilla-beoo*, water-lizard (lagarto de agua); and the Nahuatl, *cipactli* certainly means some fish or fish-like animal, a sword-fish, alligator, or the like, though exactly which is not certain, and probably the reference with them was altogether mythical.

The Second Day.

1. Maya, *ik;* 2. Tzental, *igh;* 3. Quiché-Cak.., *ik';* 4. Zapotec, *gui*, or *nii*, or *laa*, or *laala*, or *liaa;* 5. Nahuatl, *ehecatl.*

The three words of the Maya dialects all mean air, wind, breath, and, metaphorically, life, spirit, soul. So also does the Nahuatl *ehecatl*, and indeed it may be questioned whether the Maya word is not a form of the radical *eh'c* of the Nahuatl.

The Zapotec offers greater difficulties. In that tongue we have *uii*, air, wind; *chiie*, breath; which we may bring into relation with *gui;* and we find *guiiebee*, wind-and-water cloud (nube con viento y agua). Dr. Seler prefers to derive *gui* from *quii*, fire, flame, the notion of which is often associated with wind. *Ni* is apparently the radical of *nici*, to grow, increase, gain life; while *laa* or *laala* is a word with many meanings, as, warmth; heat; reason or intelligence. The sense common to all these expressions seems to be that of life, vitality.

The Third Day.

1. Maya, *akbal;* 2. Tzental, *votan;* 3. Quiché-Cak.., *akbal;* 4. Zapotec, *guèla;* 5. Nahuatl, *calli.*

The Maya *akbal* is a shortened form of *akabhal*, to grow dark, to become night. The Cakchiquel *akbal* signifies dark and, by

transfer, confused. The Zapotec *guèla* also means night, and, by transfer, old, harvest time, etc. These three, therefore, apply to the day a name of the same meaning.

The Nahuatl *calli* means "house," the Tzental *votan*, "heart." It is not difficult to connect these with the idea of darkness night or old age, on the ground that the house is that which is within, is dark, shuts out the light, etc. Possibly the derivation was symbolic. Votan, as a hero-god, was much venerated by the Tzentals, says Bishop Nuñez de la Vega; he was called "The Heart of the Nation;" and at Tlazoaloyan, in Soconusco, he constructed, by breathing or blowing, a "dark house" (una casa lóbrega), in which he concealed the sacred objects of his cult. In this myth, therefore, which I have explained at some lengths in a previous work,* we find an unequivocal connection of the ideas of "darkness" and "house" united in the myth of Votan, indicating the oneness of the origin of all three in this relation. This is proved by the coincidence that Tepeyollotl, which has in Nahuatl the same meaning as Votan in Tzental, is the god who is patron of this day.†

The Fourth Day.

1. Maya, *kan* or *kanan;* 2. Tzental, *ghanan;* 3. Quiché-Cak., *k'at* (*k'ate, k'atic, gatu*); 4. Zapotec, *guache,* or *guecbe;* 5. Nahuatl, *cuetzpallin.*

All sorts of meanings have been attributed to the Maya day name *kan;* as, hamac, rope, yellow, snake, and, by Dr. Seler, to abound in, abundance, to be in excess, etc. All agree that the Tzental *ghanan* is the same word under a slightly different form. In Cakchiquel, according to Guzman, *Compendio de Nombres*, MS., *k'an* is the name applied to the female of the iguana, or tree-lizard, and this I believe to be the original sense of the Maya and Tzental terms, corresponding closely to the Nahuatl *cuetzpallin*, which meant some species of lizard. The Za-

* *American Hero Myths*, p. 217: The word *uotan* is the general term in Tzental for "heart" in both its physical and figurative senses, such as feeling, sentiment, courage, affection, life, etc. Dr. Seler finds in the prefix *o* an indication of the Maya *ol*, Nahuatl *yol*, heart; but it is needless to explain this prefix from foreign tongues. In Tzental, *yol* means that which is held or owned in common, that which belongs to the community and is common property (comun cosa, *yol;* comunidad, *yol, olol, olil*, Lara, *Vocabulario*).

† For a full discussion of this point, see Dr. Seler, in the *Compte-Rendu* of the Congress of Americanists, vii Session, pp. 561–569. He believes the Nahuatl Tepeyollotl was a deity borrowed from the southern nations (Zapotec or Maya stocks).

potec *guache*, translated by Seler as frog or toad, is more than likely to be a variant of *gurache*, or *gorache*, iguana (see *Vocabulario Castellano-Zapoteco*, *s. v.* Lagarto).

This leaves the Cakchiquel *kat* or *qat* to be explained. Ximenes says it is *cat*, a net for carrying maize, but means lizard. Scherzer states that the present translation of the word among the Quichés is *kat*, fire. The connection probably was symbolic, the iguana being the type of fullness or food, which the net full of maize ears also typified. Precisely parallel to this is the name for this day in the Nahuatl of Meztitlan, *xilotl*, an ear of corn.

The Fifth Day.

1. Maya, *chic chan;* 2. Tzental, *abagh;* 3. Quiché-Cak., *can;* 4. Zapotec, *ci*, or *ziie*, or *guii;* 5. Nahuatl, *cohuatl.*

Pio Perez offers no explanation of the Maya *chic chan*, while Dr. Seler says that "undoubtedly" it means "a sign marked or taken." To give this sense it would have to be read *chech*, a sign or mark; *ch'aan*, something taken or carried away. There is much less difficulty in construing it as *chich*, strong or great, and *chan*, the generic Tzental term for serpent. The Cak. *can* also means serpent, especially the viper, Guzman giving *raxa can*, the green viper; *k'ana qanti*, the yellow viper, and other compounds. The Nahuatl *cohuatl* is the generic term for serpent in that tongue.*

The Tzental *abagh* is a different word. It means in that dialect and in Cakchiquel, luck, fate, fortune (dicha ò ventura, Ximenes, *Vocabulario*, MS.). This is identical with the Zapotec *ci* or *zii*, and *gui* (*xi-gui*, hado ó ventura; *bi-zi*, agorar; *gui*, ganancia; *runni-bizii*, agorar ò creer en el canto de las aves ò *culebra. Vocab. Castellano-Zapoteco*). As in this last example the serpent is especially noted as the animal whence portents were derived, the close connection of the day-names is obvious.

The Sixth Day.

1. Maya, *cimi;* 2. Tzental, *tox;* 3. Quiché-Cak., *camey;* 4. Zapotec, *lana;* 5. Nahuatl, *miquiztli* or *tzontecomatl.*

The Maya *cimi* is from *cimil*, death, to die; the Quiché-Cak. *camey* means death, or, a corpse; the Nahuatl *miquiztli* = death;

* Dr. Schellhas points out that the Maya sign for this day is derived from the head of a snake (*Zeitschrift für Ethnologie*, 1886, p. 20).

and *tzontecomatl* = a human head cut off, or, a skull. The Tzental *tox* seems to refer to the last-mentioned idea; it means what is separated, sundered, cut off; hence *tox-oghbil*, the axe or hatchet;* *q-tox*, to split, to divide, cut off (Lara, *Vocabulario*, MS.). In this it agrees precisely with the Zapotec *lana*, which the Zapotec Vocabulary renders as a separated part or thing, like a single syllable, word or letter (silaba ó parte).†

In this and the previous day-name it is interesting to find the Tzental and Zapotec coinciding, while differing entirely from the other tongues. These analogies have escaped the attention of other students of the subject; and their importance in throwing light on ancient ethnic relations is manifest.

Though the immediate meanings of the various names of the day differ widely, they are clearly connected by the same underlying train of ideas, and indicate unity of origin.

The Seventh Day.

1. Maya, *manik;* 2. Tzental, *moxic;* 3. Quiché-Cak., *queh;* 4. Zapotec, *china;* 5. Nahuatl, *mazatl.*

The Nahuatl, the Zapotec and the Quiché-Cak. words are all the ordinary terms for "deer" in those languages (Zap. *bichina*).

The Maya *manik*, I am persuaded, is derived, as Pio Perez suggested, from the irregular verb *mal* (*mani*, *manac*, as given in the *Dicc. Motul*), to pass by rapidly, to have a quick, restless motion, and *ik*, wind, the deer being referred to metaphorically by this characteristic trait.‡ Dr. Seler's suggestion, that it is a compound of *may-nik*, cloven hoof, seems more remote.

The Tzental *moxic* offers greater difficulty. It is not easy to accept Seler's suggestion that it is from the Maya *maxan*, swift, for this is a secondary word in that dialect, compounded of the negative *ma*, and means "not slow;" it is not likely that it would be used as a stem word in another dialect. According to Guzman, *Compendio de Nom. en Lengua Cakchiquel*, MS. 1704,

* "*Tox*, hacha para cortar leña," different in form from the "hacha para labrar tierra," called *bat-zil*, to be referred to later.

† Other meanings of *làna* are: the middle; dark; flesh or meat; words; secretly; etc.

‡ The hieroglyphs of this day sign, both in the Maya and Nahuatl, sometimes contain the elements of the sign of the four winds, as has been pointed out by Dr. Schellhas and Dr. Seler.

the Cakchiquels used as the generic word for deer the term *matzat*, evidently from the Nahuatl *mazatl;* and perhaps the Tzental *moxic* is merely a further corruption of the same.

The Eighth Day.

1. Maya, *lamat;* 2. Tzental, *lambat;* 3. Quiché-Cak., *canel* or *kanel*; 4. Zapotec, *lapa* or *laba;* 5. Nahuatl, *tochtli.*

The names of this day differ widely in meaning. The Nahuatl *tochtli* is the ordinary word for "rabbit," and Dr. Seler attempts to trace an analogy by translating the Zap. *lapa* as "the divided (nose)," referring to the rabbit, and then that the Tzental *lambat* and Maya *lamat* are corruptions of this word.

This procedure is unnecessary. The Maya *lamat* is evidently a shortened form of the Tzental *lambat*, which is composed of *lam*, to sink into something soft ("hundirse en cosa blanda," like light loam), and *bat*, the grain, the seed, and the name refers to the planting of the crops.

The Quiché-Cak. *kanel* is the name of the Guardian of the Sown Seed,* probably from *kan*, yellow, referring to the yellow grains of maize. The Zapotec *lāpa* or *laba* means, a drop, and a crown or garland; here probably the latter, in reference to the product of the fields. The rabbit, in Nahuatl, is the symbol of ease and intoxication.

There seems, therefore, a close analogy between these terms.

The Ninth Day.

1. Maya, *muluc;* 2. Tzental, *mulu* or *molo;* 3. Quiché-Cak., *toh;* 4. Zapotec, *niza* or *queza;* 5. Nahuatl, *atl* or (Pipil) *quiahuitl.*

The Nahuatl names mean respectively "water" and "rain;" the Zapotec are also the words for "water." *Toh* was the Quiché name of the god of the thunder-storm, from *tohil*, to sound loudly, to resound, and was thus associated with the rains. The Tzental and Maya *mulu* and *muluc* are from the radical *mul*, to heap up, to pile up; which evidently cannot refer to the "gathering together of waters," as Dr. Seler suggests,

* "Genius der Aussaat" of the natives of Ixtlavacan in Guatemala (Scherzer). On this day the ancient Cakchiquels sacrificed to the gods of fertility and abundance. *Boletin de la Sociedad Economica de Guatemala*, Dec. 15, 1870. In the *Popol Vuh*, the goddess of fertility is called *Xquiñl*. Another meaning of *bat* in Tzental is hoe (hacha para labrar tierra, Lara, *Vocabulario*).

but rather to the heaping up of the clouds in the sky on the approach of the rains.

Compare the Tzental *toh-cal*, clouds; Mame *muh*, Maya *muh-yal*, clouds (Stoll, *Ethnog. Guatemalas*, p. 59).

The Tenth Day.

1. Maya, *oc;* 2. Tzental, *elab;* 3. Quiché-Cak., *tzi;* 4. Zapotec, *tella;* 5. Nahuatl, *itzcuintli.*

The Nahuatl and the Quiché-Cak. are the ordinary terms for "dog." Such also, according to Bartolomé de Pisa, is the meaning of the Zapotec *tella*, though I do not find it in this sense in the Vocabularies.* Probably it refers to some particular species.

The Maya *oc* has a variety of meanings, as, a foot or foot-print; a handful; an entrance (from the verb, *ocol*, *ocoltah*, *ocolte*, to go in); a theft or thief (from the verb, *ocol*, *oclah*, *ocle*, to steal). I am inclined to believe that the last-mentioned sense was intended, the dog being characterized as "the stealer," as this seems to be the signification of the Tzental *elab*. The two words given by Lara for "theft" (ladronicio) are *elec* and *ochol*, in which we can scarcely fail to recognize the two names of the day in these two dialects. The dog steals in and carries off the meat whenever he gets a chance. The Mayas adopted the term from the stem *ochol*, because this was the word for theft in their dialect, in which the stem *elec*, common to the Tzental, Zotzil, Cakchiquel and Quiché, does not appear.†

The Eleventh Day.

1. Maya, *chuen;* 2. Tzental, *batz;* 3. Quiché-Cak., *batz;* 4. Zapotec, *loo;* 5. Nahuatl, *ozomatli.*

The Nahuatl is the term for "monkey;" *batz* in Quiché, Cakchiquel and Tzental also means monkey, specifically a dark-haired, bearded variety. In the Tzental, according to Lara's Vocabulary, another species is called *chiu*, and this unquestion-

* "En el pueblo de Coatlan tenian un Cazique que se llamaba *Petella*, que significa *perro*," etc. Herrera, *Decadas de Indias*, Dec. iii, Lib. iii, cap. xiv. This chief was one of the Zapotec rulers who secretly continued the ancient rites after the introduction of Christianity. Dr. Seler attempts to obtain the meaning "dog" by supposing *tella* is derived from *tee-lao*, "mouth downward," referring to some myth of a dog falling from the sky. This seems strained.

† The common term for "wolf" in Tzental and Zotzil is *ocquil.*

ably is the origin of the Maya *chuen* (a word which has no signification in that dialect) and of the name *chouen* in the National Book, the *Popol Vuh*, of the Quichés.*

The Zapotec syllable *loo* is given as the name of the 11th, the 14th and the 20th days, but is probably an abbreviation of different words. Taken alone, it has various meanings, as, face; eyes; above; point; beginning, first, etc. Here it may be intended for *bil-loo*, monkey, as the form of the name generally given in Cordova's Calendar is *pel-loo*.

The Twelfth Day.

1. Maya, *eb;* 2. Tzental, *euob;* 3. Quiché-Cak., *e* or *ee;* 4. Zapotec, *pija;* 5. Nahuatl, *mallinalli* and *itlan*.

The Nahuatl and Zapotec names both signify the brush or broom of twisted twigs or stiff grass used for cleaning and dusting, and this grass itself.

In Maya, *eb* is the plural of *e*, which means points or ends, like those of pins, or thorns (puntas como de alfiler, aguja, espina y cosas asi, *Dicc. Motul*), and plainly was intended to designate the broom by reference to its numerous points. From the same idea, rows of teeth received the same name. The Tzental and the Quiché names, *e* and *euob*, the latter a plural, were from the same radical and had the same signification. All five, therefore, conveyed similar ideas, and it is noteworthy that the day-name *itlan*, used in Meztitlan, is from *tlantli*, tooth.†

The Thirteenth Day.

1. Maya, *ben;* 2. Tzental, *ben;* 3. Quiché-Cak., *ah;* 4. Zapotec, *quii*, or *i*, or *laa;* 5. Nahuatl, *acatl*.

The Nahuatl means reed or stalk, as do also the Zapotec *quii* and *laa*. The Quiché-Cak. *ah* denotes a green cornstalk or sugar cane (la caña ó la caña dulce; ó mais tierno, Ximenes). The Tzental and Maya *ben* has been more difficult to analyze. Pio Perez and Dr. Seler expressed themselves at a loss to offer

* The brothers Hun Batz and Hun Chouen were conquered and transformed into monkeys by the victors. *Popol Vuh*, p. 119. The present pertinence of this myth is that it shows that the words *batz* and *chouen* were both understood to refer to species of monkeys by the Quichés.

† Though it may possibly be a shortened form of *itztlan*, the name of a plant used in making such brooms. Comp. Sahagun, *Historia de Nueva España*, Lib. xi, cap. vii.

a satisfactory rendering of it. I find, however, that in Tzental the dried cornstalk (caña de mais seco) is called *cagh-ben*, and from this I doubt not this day-name in that dialect and the Maya was taken and syncopated. The verb *ben* or *been* in Tzental means "to walk, to go;" but in the above compound the *ben* is from the Maya stem *benel*, to be used up, to be dead (faltar ó quedar algo por hacerse de lo que se hacia, morirse, *Dicc. Motul*).

We thus obtain substantially the same meaning for all the names of the day.

The Fourteenth Day.

1. Maya, *ix* (*gix, hix*); 2. Tzental, *hix;* 3. Quiché-Cak., *balam* or *hix;* 4. Zapotec, *eche;* 5. Nahuatl, *ocelotl,* or (Pipil) *teyollocuani.*

The Nahuatl name *ocelotl* means tiger, as does the Zapotec *eche* and the Quiché *balam*, referring of course to the American tiger or jaguar.* The Pipil *teyollocuani*, literally "soul-eater," means sorcerer, as does the Maya, Tzental and Cakchiquel word, *hix* or *ix*. The power of transforming themselves into a tiger was one of the peculiar faculties of the sorcerers; hence they were called by the Quichés, *balam*, which means both tiger and to transform one's self into one (*Balam:* tigre, ò hacerse tigre, Ximenes).

It is probable that *ix* is a variant of *ik'* or *igh*, wind, breath, life, as Lara gives: "*Vuch-igh*, ó *Vuch-ix*, hechicero que cura soplando," in which *vuch* is to blow, as the medicine man through a tube; and *igh* is air, wind, etc. In the medicine rites over most of the continent, and especially in Central America, blowing upon the part or in a certain direction was the leading ceremony.

The Fifteenth Day.

1. Maya, *men;* 2. Tzental, *tziquin;* 3. Quiché-Cak., *tziquin;* Zapotec, *naa* or *ñaa;* 5. Nahuatl, *quauhtli.*

The Nahuatl *quauhtli*, eagle, and the Tzental and Quiché *tziquin*, bird in general, are sufficiently alike to show a common origin.

The Zapotec *naa* is identified by Dr. Seler with *naa*, mother; but I believe it is from the widely extended root word, *na* or *ña*,

*The full form in Zapotec is *be-eche-guia.*

to know, to understand, to be able through knowledge. In this sense it exactly corresponds to the Maya *men*, which means to understand, to be able to do (*men:* entender algo, hacer algo, *Dicc. Motul*). Hence, in this latter tongue, *ah-men* means the man of knowledge, the wise one, the master of wisdom.* The bird, as the symbol of wisdom and knowledge, was familiar to the mystical lore of these peoples.

The Sixteenth Day.

1. Maya, *cib;* 2. Tzental, *chabin;* 3. Quiché-Cak., *ahmak;* 4. Zapotec, *guilloo,* or *loo;* 5. Nahuatl, *cozcaquauhtli,* or (Pipil) *tecolotl,* or (Mextitlan) *teotl itonal,* or *temetlatl.*

The Nahuatl names of this day mean: *cozcaquauhtli* (from *quauhtli*, eagle; *cozcatl*, necklace), the ringed vulture, *Sarcoramphus papa*, or "royal zopilote" of the ornithologists, a handsome bird with a ring of red feathers around its neck; *tecolotl*, the owl; *teotl itonal*, the day god, or the sun god; *temetlatl*, the pestle or corn-crusher. The Zapotec, which Cordova gives also in the forms *pillaloo*, *peoloo*, etc., is likely to be for *ba-loo*, crow or raven. The Quiché *ahmak* means "the master of evil," which appears to be a reference to the owl, which was esteemed a bird of evil omen and bad fortune by these peoples†—a metaphorical rendering therefore of the Pipil *tecolotl.*

The Maya *cib* is assigned by Pio Perez the meaning "wax," or "copal gum," and is derived by Dr. Seler from *cii*, something that smells or tastes good, as spice or incense. I believe it to be merely another form of *tzib*, to paint (*tzibal*, cosa pintada de muchos colores), and that it refers to the brilliant neck and head feathers of the ringed vulture.

The Tzental radical *chab* means honey, wax, a bee, a late meal, to fast, syrup, to end or cease, to remain, mourning, funeral rites. It is not easy to select from such an abundance. In the

* As the Zapotec *benni chi na*, "man of knowledge." Another meaning of Zap. *ñaa* is "hand."

† For examples see my *Essays of an Americanist*, pp. 114, 169. The Nahuatl *tlaca-tecolotl*, "man-owl," meant a necromancer, one who worked injury. See Sahagun, *Hist. de Nueva España*, Lib. iv, cap. xi. Dr. Seler translates *ah-mak* by "der die Augen aufrisst," but in this he has mistaken the word *mak*, evil, for *mah* (arrebatar, Villacañas, *Vocabulario*, MS.). But I observe that Dr. Stoll gives as the Chontal word for zopilote, *ajmaa* (*Zur Ethnographie Guatemalas*, p. 54). The adjective *mak*, bad, is a compound of *ma lek*, not good.

Cakchiquel, *chab* means arrow, and to shoot one; also to open the mouth; while *ch'ab* is mud, clay, mire. As red and black clays were the primitive pigments, this last may connect the Tzental day name with the Maya.

The Seventeenth Day.

1. Maya, *caban;* 2. Tzental, *chic;* 3. Quiché-Cak., *noh;* 4. Zapotec, *xoo;* 5. Nahuatl, *ollin,* or (Meztitlan) *nahui olli,* or (Pipil) *tecpila nahuatl.*

The Maya *caban* has been explained by Dr. Seler diversely as "what is below," or "brought below," and again as "above," "what is above," "heaven," etc. Pio Perez offered no explanation of it. I derive it from the Maya radical *cab*, might or strength (la fuerza, rigor, ó fortaleza de alguna cosa, *Dicc. Motul*). In this sense it corresponds precisely in meaning with the Tzental *chic* (= Maya, *chich*, cosa fuerte y dura), the Quiché-Cak. *noh*, strong, great, and the Zapotec *xoo*, which has the general signification of force, power or might (comp. Cordova, *Arte Zapoteca*, p. 114).

The Nahuatl *ollin* or *olin* means motion or movement, the result of force applied, as *in tlalli olini*, the earth moves, an earthquake. *Nahui olin*, "the four movements," is an expression which refers to the apparent movements of the sun.

The Eighteenth Day.

1. Maya, *edznab;* 2. Tzental, *chinax;* 3. Quiché-Cak., *tihax;* 4. Zapotec, *gopaa;* 5. Nahuatl, *tecpatl.*

The Nahuatl term means flint, especially the flint stone knife used in sacrificing to cut the victim. The Zapotec *gopaa*, which Dr. Seler derives from *rogopa*, cold, is more likely to be a variant of *guipa*, a sharp point or edge, whence the word for stone knife, *gueza-guipa*, from *guia*, stone.

The Tzental *chinax* is an old or sacred form for the usual *zninax*, knife (Lara); and the Cakchiquel *tihax*, the literal meaning of which is, according to Ximenes, "it bites, scraping" (muerde rasgando), would seem to be a figurative and highly correct expression for such an implement.

There remains the Maya *edznab.* Pio Perez offers no explanation of it, while Dr. Seler suggests that it may be from the

root *edz*, hard, solid. It appears rather to be a figurative expression for the sacrificial knife, from *nab*, something anointed or blood (cosa ensangrentada),* and *edz*, to adjust, to point, to sharpen (as in the phrase, *edzcabte a tokyah*, punta la lanceta para sangrar, *Dicc. Motul*). Thus, the same signification underlies these various names.

The Nineteenth Day.

1. Maya, *cauac;* 2. Tzental, *cahogh;* 3. Quiché-Cak., *caok*, or *cook;* 4. Zapotec, *ape, appe*, or *aape;* 5. Nahuatl, *quiahuitl*, or (Pipil) *ayotl.*

The three Maya dialects present obviously the same word. The Tzental has been by some writers erroneously spelled *cabogh*, and Dr. Seler, following this false orthography, obtains for it the extraordinary meaning, "the darkness descending and overspreading the Earth!" Nuñez de la Vega gives *cahogh*, and no other form. It is a pure Mayan word, meaning "lightning and thunder," the concomitants of the electrical storm. The Pokomchi and Pokomam have precisely this form, *cahok*, *cohoc;* Lara gives the Tzental *chauc* (relampago, trueño, tronido, *Vocabulario*, MS.), the Chontal *chauoc;* the Huasteca, *tzoc*, proving that it is an ancient radical of this family, as this is the remotest of the Mayan dialects.

The Zapotec *ape*, *api*, etc., which Dr. Seler translates "cloud covered," evidently means the same, as we see in the words *laari-api-niza*, *ri-api-laha*, translated "relampago, relampaguear," in the *Vocabulario Castellano-Zapoteco* (Mexico, 1893).

The Aztec *quiahuitl* is the ordinary word for rain; while the Pipil *ayotl* means turtle, which is quite in correspondence with "lightning" as the day-name, this being, as Dr. Schellhas has so well shown, the "lightning animal," *das Blitzthier.*†

* To confirm this rendering, I add that Sahagun specially states that the *tecpatl*, or flint, was represented in the Mexican Calendars "stained with blood for the half of its length," *Historia de la Nueva España*, Lib iv, Appendix. It was the *iztapaltotec*, "pedernal ensangrentado" of the *Codex Telleriano-Remensis*, Lam. xxxii.

† Dr. Schellhas points out that in the Maya pictography the turtle is a sign of the lightning, or the thunder-storm. It is associated with the hieroglyphs of the months Kayab and Pop. See his article, "Die Göttergestalten der Maya Handschriften" in the *Zeitschrift für Ethnologie*, 1892, p. 120. It is not easy, at first sight, to understand why so proverbially slow an animal should become the symbol of the lightning. My explanation is that it is an example of the "ikonomatic" method. The Mayan term for lightning is *cooc*, or *caoc;* the word for turtle is *coc; from the similarity of the sounds*, the turtle was used in the picture writing to mean "lightning."

The Twentieth Day.

1. Maya, *ahau;* 2. Tzental, *aghual;* 3. Quiché-Cak., *hun ahpu;* 4. Zapotec, *lao,* or *loo;* 5. Nahuatl, *xochitl,* or (Meztitlan) *ome xochitonal.*

The Maya word means ruler or chieftain, literally, "the master of the collar," *i. e.*, the insignia of office;* the Tzental *aghual* is from the same root and signifies "sovereignty;" the Quiché *hun ahpu*, the One Master of Power, conveys a similar idea. The Nahuatl *xochitl*, flower or rose, is explained in its real sense by the *xochitonal* of the dialect of Meztitlan, "the flower of the day," *i.e.*, the sun. This has been fully shown for the Nahuatl by Dr. Seler, and there is no doubt but that the "ruler" referred to by the Maya dialects is specifically the sun, the day god.

The Zapotec *lao*, or *loo*, here has the meaning "eye," that is, in reference to the sun as "the eye of the day," precisely as in the Maya expression *Kin ich*, which I have elsewhere explained.†

All the names of the 20th day, therefore, convey the same esoteric signification.

A careful examination of this list of day-names shows that at least in eight instances (Days 1, 2, 7, 11, 13, 17, 18, 19) the names are merely translations of the same word; and that substantially in all the remainder, the differences which exist arise from using a figurative instead of a literal rendering of the name.

There can be no question therefore but that the Calendar names had one and the same origin; but in which of the three linguistic stocks represented the list offers no positive evidence. The Zapotec, which is the language geographically intermediate between the Maya dialects and the Nahuatl, agrees with the latter in five instances where it disagrees with the former; and agrees with the Maya in three instances where it disagrees with the Nahuatl names. Three times the Zapotec agrees with the

*The derivation of *ahau* from a theoretical root *ahu*, as proposed by Dr. Seler, is unnecessary; *ah-auh*, "the collar-bearer," because this was a symbol of authority (compare the stone collars from Porto Rico, etc.), remains the most plausible etymology.

† The full expression is *Kin-ich-ahau*, Lord of the Eye of the Day, which explains this day-name, Ahau. See my *American Hero Myths*, pp. 153, 158.

Tzental, where both disagree with all the other dialects. But these instances do not justify any conclusion. The possibility remains that all five of the lists are derivatives from some older and now lost series of day-names, such as we know existed among the Mixtecas and among the Totonacos, tribes of ancient culture, who made use of this Calendar at a remote date.

In all five instances there is evidence that at the time of the Conquest there was considerable uncertainty among the natives themselves as to the derivation and literal meaning of many of these names. Either they belonged to a much older and forgotten stratum of the tongue, or to a priestly and esoteric form of speech, such as has been found among many native tribes on the continent. But this esoteric speech is nearly always largely archaic.

§ 12. Analysis of the Month-Names.

While the names of the twenty days of each month are practically identical in all the five languages under consideration, the reverse is the case with the names of the eighteen months which made up the vague solar year. These differ widely in tribes very closely related, as the Quichés and Cakchiquels; and even in the same dialectic area, as among the Nahuas. The month-names of the last-mentioned have been carefully analyzed by various writers, notably Dr. Seler, and I have not found the names of the Zapotec months; so I shall confine myself to an examination of them in the Maya, Tzental, Cakchiquel and Quiché dialects, and in the language of the Chapanecs, in which he month-names, but not the day-names, have been preserved.

THE MAYA MONTHS.

The earliest authority for the names of the Maya months is the Bishop Diego de Landa in his well-known description of Yucatan, composed about the middle of the sixteenth century.* Another list, not differing materially, was published by the Yu-

*Landa, *Relacion de las Cosas de Yucatan*. An edition with a French translation by the Abbé Brasseur (de Bourbourg) was published at Paris in 1864. One more correct and complete, in Spanish only, appeared under the editorship of Juan de Dios de la Rada y Delgado at Madrid, in 1884. For a comparison of these, see my "Critical Remarks on the Editions of Diego de Landa's Writings," in the *Proceedings* of the American Philosophical Society, 1887.

catecan antiquary, Pio Perez, copied from the books of Chilan Balam in his possession.*

An examination of these names shows that they are materially different from those in use among the other tribes of this stock. They appear, in Yucatan, to have reference generally to the religious festivals and ceremonies recurring at certain seasons; while in the other branches of the stock, they usually indicate the seasons or the appropriate periods for agricultural operations.

Months of the Maya Calendar.

1. Pop.	10. Yax.
2. Uo.	11. Zac.
3. Zip.	12. Ceh.
4. Zodz.	13. Mac.
5. Tzec.	14. Kan kin.
6. Xul.	15. Moan.
7. Yax kin.	16. Pax.
8. Mol.	17. Kayab.
9. Chen.	18. Cum ku.

Derivation.

1. *Pop.*—Literally, a mat or rug. But in its metaphorical sense in most Maya dialects, the community or commonwealth. Thus *popol na*, the public buildings, people's house; *popol vuh*, the national book, etc. As the name of the first month of the year it probably refers to the great national festival which then took place as described by Landa, p. 276, *sq.*

2. *Uo.*—Usually translated "frog;" there is a large edible species so called, who croak in a melancholy way (dan gritas muy tristes, *Dicc. Motul*). It is also the word for the fruit of the pitahaya, *Cereus trigonus;* in Tzental, *uanac.* The frog was the symbol of water and the rains.

3. *Zip.*—Pio Perez says there is a tree called *zip.* I can find

* Don Juan Pio Perez gave a copy of his essay to Mr. John L. Stephens, who published it (imperfectly) in the Appendix to his *Travels in Yucatan.* Later it appeared in the *Registro Yucateco;* from which it was copied by the Abbé Brasseur into the volume containing his edition of Diego de Landa.

The "Books of Chilan Balam" are the sacred books of the modern Mayas. I have described them at length in an article in my *Essays of an Americanist* (Philadelphia, 1890).

none such in my authorities. The real significance of the name is revealed by that of the goddess of hunting, in whose honor the festivals of the month *Zip* were held. This was *Zuhuy Zip*, the virgin *Zip*, her name being properly *Dzip*, to skin, to dress slain animals (see Landa, p. 290).

4. *Zodz.*—Also given *Tzoz* and *Zotz*. Probably the correct orthography is *Dzoz*, which means to be seated, as in waiting; Landa stating that in this month there was no festival, but merely preparations for one which was to follow. Another meaning of *Dzoz* is the setting or brooding of birds. *Zodz* is the generic term for the bat; there are no words *Zotz* or *Tzoz*.

5. *Tzec* or *Zeec.*—In this month the bee keepers held their annual fast and festival. The word *Tzec*, to admonish, to correct by chastisement, apparently refers to some religious penance which was then practiced. In Tzental, *Tzec* means scorpion.

6. *Xul.*—Means end, conclusion. At the end of this month, on its last day, at the close of the five days' feast of *chiich kaban*, "the calling down of the Great Hand," the chief god of the Mayas, *Ku kul can*, was believed to descend from heaven and accept the offerings presented to him by the faithful (Landa, p. 302).

7. *Yax kin.*—A compound of *yax*, blue or green (the Mayas not distinguishing between these hues); and *kin*, sun, day or season. This month was largely passed in a religious exercise called *olob dzab kam yax*, "giving the hearts to the service of the blue." All instruments, weapons and utensils, and even the doors of the houses, were then stained with a blue dye (Landa, p. 303). These were therefore the "blue days." The form *Dze yax kin*, given by Pio Perez is explained by the *Dicc. Motul* as the height of summer, probably from the blueness of the sky at that season.

8. *Mol.*—From the verb *mol*, to come together *en masse*, referring to the general reunion, *fiesta general*, which Landa tells us was celebrated in this month, when even the little girls were

present, brought under the care of an old chaperon known as the *ix mol*, "conductress of the crowd."

9. *Chen* or *Cheen*, properly *Ch'een*.—Derived by Pio Perez from the word for well or spring, but properly from a homonymous root which means, to be quiet, to keep silence, referring, I take it, to the solemn action of renewing the gods or making new idols, which took place in this month; a work, says Landa, they undertook with great fear—*con mucho temor*.

10. *Yax*.—In this month occurred the cleaning and renovation of the temples and the installation of the new gods. Hence *yax* is here used in the sense green, fresh, new or first, with reference to this function.

11. *Zac*.—In this month an important rite was celebrated by the hunters in expiation of the blood shed in the chase. As in the native symbolism white signifies peace and propitiation, the month probably derived its name, *zac*, white, from this rite.

12. *Ceh*.—The common word for deer or any large food game. Landa does not assign any festival to this month, but the name probably has reference to that of the hunters just referred to.

13. *Mac*.—In this month the Mayas celebrated the rite of *tup kak*, "extinguishing the fire," for the purpose of securing abundant rains for the harvest. A fire was built in the court of the temple, the hearts of various animals thrown into it, and as soon as they were consumed the priests poured water upon the flames and extinguished them (Landa, p. 254). The root *mac* means to cover, or, a cover, the rite being a "couvre-feu," or covering up of the fire.

14. *Kan kin*.—Translated by Pio Perez "yellow sun," "because in this month, owing to the forest fires, the sun looks yellow through the smoke in the air."

15. *Moan*, or, *Muan*.—Rainy or cloudy. Pio Perez adduces the term *moan kin*, cloudy day, threatening to rain. The word is not in the old dictionaries, but it is doubtless from the same

root as *manaal*, which the *Dicc. Motul* explains as "aguaceros que vienen antes de que entran las aguas de golpe, con los cuales suelen florecer arboles, matas y yerbas." *Muyal* in Maya means "cloud."

16. *Pax.*—The principal feast in this month was called *pacum Chac*, the recompense or repayment of *Chac*, the gods of rain. The name was probably derived from this term; though it may be from *paxah*, to play upon a musical instrument, as Pio Perez suggests, with reference to the music of the festival.

17. *Kayab.*—From *kay*, to sing, to warble; applied both to persons and birds. No festival is assigned to this month.

18. *Cum ku.*—Translated by Pio Perez as a loud and distant noise like thunder, etc. No such derivation is supported by the old authorities. *Cum*, in Maya, is an earthen jar or pot, Nahuatl, *comitl; cum ku* is the potter's furnace in which such jars are burned (*Dicc. Motul*); but as *ku* also means "god," *cum ku* is the god of the vase or jar, the deity so often represented in Maya and Nahuatl art, reclining on his back and holding a vase in the centre of his stomach (Le Plongeon's *Chac mol*, etc.). He was the god of the rains, this month being at the height of the rainy season.

THE TZENTAL MONTHS.

The original authority for the names of the Tzental months is Fr. Juan de Rodaz, in his *Arte de la Lengua Tzotzlem ó Tzinacanteca*, 1688, MS., a copy of which was in the possession of the late Abbé Brasseur de Bourbourg, but which I have not seen. It would appear that the Zotzils and Tzentals had the same month-names. We have, further, the testimony of a Mexican writer, Emetorio Pineda, who says that at the time he wrote, 1845, the natives continued to divide the solar year into eighteen months, the names of which he gives.* Their use, he states, was to arrange for their agricultural operations, and to fix the dates for their overt or secret religious rites.

*Pineda, *Descripcion Geografica de Chiapas y Soconusco*, pp. 111, *sq.* (Mexico, 1845).

The order and the names which he gives are as follows:

Months of the Tzental Calendar.

1. Tzun.	10. Elech.
2. Batzul.	11. Nichquin.
3. Si sac.	12. Sban viniquil.
4. Mucta sac.	13. Xchibal viniquil.
5. Moc.	14. Yoxibal viniquil.
6. Olalti.	15. Xchanbal viniquil.
7. Ulol.	16. Poin.
8. Oquinajual.	17. Mux.
9. Veh.	18. Yan kin.

Derivation.

1. *Tzun.*—Allied to the Maya *chun*, the beginning; *dzunul*, to begin; so called from being the first month of the Tzental year (about April 1). Or from Zotzil *tzunel*, to sow (sembrar, Ferraz, *Lenguas Indigenas de Centro-America*, p. 57).

2. *Batzul.*—The Tzental word *batz* means a species of monkey which make a howling noise and are bearded; *batzil* means native, as opposed to foreign, *e.g.*, *batzil tah*, a knife of native manufacture; but I would not derive the month-name from either of these; rather from *bat*, the word in Tzental and Maya for grain, seed, etc., referring to the month in which the seed-corn was prepared.

3. *Si sac.*—For *tzi zac*, "little white;" probably, as in the Quiché Calendar, from the blossoming of certain white flowering plants at this time.

4. *Mucta sac.*—"Great white," referring to the increasing abundance of flowers.

5. *Moc.*—Pineda says this signifies the month in which the fences of the cornfields were made. It is evidently the Maya *moc*, to fasten together, whence the Tzental *macteibil*, wooden fence (cercado de palos, Lara, *Vocabulario Tzendal*).

6. *Olalti.*—This and the two following months were those in which the corn was planted. Both *olalti* and *ulol* appear

related to the noun *aual*, planting, and the verb *xaualighon*, to plant. In Zotzil *ololak'* is to produce, to bring forth.

7. *Ulol.*—See the preceding name.

8. *Oquinajual.*—Probably "the planting time," from *aual*, planting, and *quin*, time, day, season.

9. *Veh* or *ueh.*—Pineda's note here is: "In this month the plants are attacked by diseases." The name is plainly from the verb *uehel*, applied to the premature falling of leaves and fruits (caerse la semilla y granos y las hojas de los arboles, Lara, *Vocabulario*).

10. *Elech.*—Pineda remarks, "the healthy winds arrive." The name is a compound of *ochel*, west, and *ihc*, wind, these being dry and salubrious.

11. *Nichquin.*—This name, observes Pineda, "indicates the flowering season." It is the Tzental word *nichim*, flowers, from *xnich*, to flower, and *quin*, day, season.

12. *Sban viniquil.*—The word *viniquil*, *vinquilel*, or *vinaquin* means time, period or season. This and the three following months, called respectively the first, second, third and fourth seasons, are understood by Pineda to refer to the four periods of the growth of the maize, the first that of fecundation, the second of the formation of the grain, the third when it is in milk, the fourth when the grain hardens. This seems an error, as it does not require in that latitude eighty days for these changes after the fecundation of the ear. No doubt it refers to the ripening of the various plantings, and so the expressions are understood by Lara: "*ox vinaquin ixim*, mais que se hace en 60 dias."

13. *Xchibal viniquil.*—"Second season." See above.

14. *Yoxibal viniquil.*—"Third season." See above.

15. *Xchanbal viniquil.*—"Fourth season." See above.

16. *Pvin.*—"In this month," observes Pineda, "the beehives should be emptied and the harvests gathered."

17. *Mux.*—"This name," says Pineda, "indicates the approach of cold." This suggests a derivation from the Tzental *q'muc ba*, to cover one's self; which is confirmed by the similar meaning of the Cakchiquel month-name, *Pariche*, which see.

18. *Yax quin.*—From *yax*, green or new; *quin*, day or season. Pineda remarks that it is the season of Easter, thus showing that the Tzental year began about April 1.

THE CAKCHIQUEL MONTHS.

The names of the Cakchiquel months are furnished by several old authorities, as by Father Varea in his *Vocabulario*, MS., and Father Coto in his similar work.* There are also extant several native Cakchiquel Calendars, a careful copy of one of which, bearing the date 1685, is in my possession.

The names of both the Cakchiquel and Quiché months, with proposed translations, were published by Señor Gavarrete in his school Geography of Guatemala, edition of 1868, but this portion is omitted in all other editions of that work.†

There is considerable confusion in the Spanish authorities about the sequence of the Cakchiquel and Quiché months; for this reason I have not followed any of them, but have adopted the sequence as given in the Calendars in my possession composed and written by the natives themselves.

Months of the Cakchiquel Calendar.

1. Tacaxepual.	10. Rucab tok'ik'.
2. Nabey tumuzuz.	11. Nabey pach.
3. Rucab tumuzuz.	12. Rucab pach.
4. Cibixic.	13. Tziquin k'ih.
5. Uchum.	14. Cakan.
6. Nabey mam.	15. Ibota.
7. Rucab mam.	16. Katic.
8. Lik'in k'a.	17. Izcal.
9. Nabey tok'ik'.	18. Pariche.

*Both these MSS. are in the Library of the American Philosophical Society, Philadelphia.

†*Geografia de la Republica de Guatemala*, p. 82. Segunda Edicion (Guatemala, 1868).

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Derivations.

1. *Tacaxepual*, or *Tecoxepual*, or *Tequexepual*.—The best authorities agree that this was the first month of the Cakchiquel year, and the first corn planting (tiempo principio de año ó tiempo de sembrar las primeras milpas. Varea, *Vocab.*, MS.). The word is clearly a corruption of the name of the second month in the Nahuatl Calendar, *Tlaca Xipeualiztli.*

2. *Nabey tumuzuz.*—The first *Tumuzuz.* Father Varea states that this month was at the beginning of the winter rains, and that it derived its name from a species of flying insect which then made its appearance (viene quando empiezan los primeros aguaceros del invierno. Aparean y andan volando unos gusanillos que llaman *tumuzuz. Vocabulario*, MS.).*

3. *Rucab tumuzuz.*—The second *Tumuzuz.*

4. *Cibixic.*—From *cib*, smoke, mist or vapor. Varea observes that the natives were accustomed to plant in this month, and that it follows *tumuzuz.* It derived its name from the smoky appearance of the atmosphere at this season, or from the custom of burning brush in clearing the ground. Compare the Maya month *Kan kin.*

5. *Uchum.*—"Season for replanting." Father Coto describes it as the month for planting gardens (bueno para hacer almazigos y sembrar ortaliza. *Vocabulario Cakchiquel*, MS.). The derivation is obscure. The root *uch* means a species of fox; a louse; gum copal; and chills and fever. In the neighboring dialect of the Tzotzils, *uchum* means to grind in a mill, from which *ghuchumbil*, a corn mill (moler, molino).

6. *Nabey mam.*—"First old man." In most of the dialects *mam* means the maternal ancestor. Here the word is used metaphorically in the sense "prematurely old," because the corn planted in this and the following months ripened prema-

*Dr. Stoll (*Ethnologie der Indianerstämme von Guatemala*, s. 60) found the swarming times of the termites, *Calotermes castaneus*, in Guatemala, to be March 22 and May 24, dates which do not coincide with the Calendar. He omits, therefore, the former, and refers to an occasional flight about the middle of June.

turely, and did not reach full growth; and they believed the same was the case with animals born at this time (tiempo de revejidos, porque no crecia muy alta la milpa que por este tiempo se sembraba, y aun las criaturas que nacian. Note to the Calendar). Doubtless it was for this reason that, as Father Varea tells us, both months of *mam* were regarded as of evil portent, and the natives were accustomed to say: *Itzel k'ik ca vinak k'ih mam*, "they are bad days, the forty days of mam." *Vocabulario*, MS.

7. *Rucab mam.*—"Second old man."

8. *Lik' in k'a.*—"Soft to the hand," from *li'k*, soft, and *k'a*, hand. The expression refers to the soil which was then soft owing to the rains (tiempo en que esta la tierra blanda y resbalosa por las muchas aguas. Note to the Calendar).

9. *Nabey tok' ik'.*—"The first cacao harvest," from *tok'*, the cacao harvest (cosecha de cacao, Ximenes. *Vocabulario*, MS.).

10. *Rucab tok' ik'.*—"The second cacao harvest."

11. *Nabey pach.*—"The first hen hatching." (Tiempo de empollar las cluecas. Note to the Calendar.) The name is from the verb *pache*, to brood, to set as a bird (Ximenes).

12. *Rucab pach.*—"The second hen-hatching."

13. *Tziquin kih.*—"The season of birds," from *tziquin*, bird, *k'ih*, day, time, season.

14. *Cakan.*—Derived from *k'ak*, red; according to the Cak. Calendar from the reddish clouds (celages rojas) often seen at this season; according to others, and more probably, from a species of red flowers which blossom at this time.

15. *Ibota*, or *Obota*, or *Botam.*—A note to the Calendar says: "The season of various colors, or, of mats rolled up." In the latter sense the name would be from the verb *bot*, to roll up, *botal*, that which is rolled up (lo arollado como petate. Guzman, *Vocabulario*, MS.). Gavarrete gives "rollo de estera," a roll of mats. The signification is not clear.

16. *K'atic*, or *Qatic*.—This is explained in a note to the Calendar as "pasante ó siembra comun." The derivation suggested would be from *k'atoh*, a banquet, a festival, and to invite to such.

17. *Izcal*, or *Itzcal*.—Translated in the Calendar as "the season of sprouts or of throwing out shoots" (retoñar ó echar primipollos). The word is undoubtedly the Nahuatl *Itzcalli*, the name of the eighteenth month in the Mexican year. Its signification is "renewal," or "resurrection," or "growth;" this is indicated in the application of the word in the Cakchiquel Calendar.

18. *Pariché*, or *Payriché*.—"The season for covering, in order to protect one's self from the cold," says a note to the Calendar. The derivation is from *parah*, the covering of palm leaves used to protect a person from the rain; and *che*, tree or wood. The same idea is conveyed in the Tzental month-name *Muc*. Gavarrete's explanation, "firewood," from *che*, wood, and *parquii*, bushes or small trees, is not tenable.

THE QUICHÉ MONTHS.

Although there was little difference between the Quiché and Cakchiquel dialects, their month-names varied in several instances. Our sources of information concerning the Quiché names are authentic, several of their Calendars dating from the seventeenth century having been preserved. From these Gavarrete published a list in the work already referred to, and I have in my possession a copy of a native Calendar in the Quiché dialect written about 1722.

Months of the Quiché Calendar.

1. Tequexepual.
2. Tziba pop.
3. Zac.
4. Ch'ab.
5. Nabey mam.
6. Ucab mam.
7. Nabey lik'in k'a.
8. Ucab lik'in k'a.
9. Nabey pach.
10. Ucab pach.
11. Tzizi lakam.
12. Tziquin k'ih.
13. Cakam, or Cakan.
14. Botam.
15. Nabey zih.
16. Ucab zih.
17. Rox zih.
18. Chee.

Derivations.

1. *Tequexepual.*—See Cakchiquel months, No. 1.

2. *Tziba Pop.*—"Painted mat." Compare the Maya name for their first month.

3. *Zac.*—"White." The same as the eleventh Maya month, but with the Quichés it probably referred to certain white flowers blooming at this season.

4. *Ch'ab.*—Gavarrete translates this as "bow," which is, in fact, the meaning of *chab*;* but I have no doubt that the right word is *ch'ab*, from *ch'aban*, mud, mire, from the muddy condition of the soil at this season.

5. *Nabey mam.*—See the sixth Cakchiquel month, of this name.

Gavarrete inserts as the fifth month, between *Ch'ab* and *Nabey mam*, a month named *Hun bix k'ih*, "the season of the first singing" of certain birds, or, "of the first fires," *bix* having both these significations. He omits the name of *Botam* for the fourteenth month, and thus preserves the proper number.

6. *Ucab mam.*—The second *mam.* See above.

7. *Nabey lik'in k'a.*—The first *lik'in k'a.* See the Cakchiquel month of this name.

8. *Ucab lik'in k'a.*—The second *lik'in k'a.*

9. *Nabey pach.*—The first *pach.* See the Cakchiquél month of this name.

10. *Ucab pach.*—The second *pach.*

11. *Tzizi lakam.*—*Tzizi*, from *tzizil*, the small sprouts or shoots which begin to appear; *lakam* means flags, or banners, and seems to refer to the shape or appearance of these.

*In the Quiché, Cakchiquel, Pokomam and Pokomchi dialects, *chab* means both "bow" and "arrow." Strictly it means the bow only, the arrow being *al*, or *yal chab*, "son of the bow."

12. *Tziquin k'ih.*—"Season of birds." See the Cakchiquel month of this name.

13. *Cakam.*—See the Cakchiquel month of this name.

14. *Botam.*—See the Cakchiquel month *Ibota.*

15. *Nabey zih.*—The first *zih.* The word is explained as a tree which bears abundant white flowers and blossoms at this season. Gavarrete gives erroneously *Tzih*, "word."

16. *Ucab zih.*—The second *zih.*

17. *Rox zih.*—The third *zih.*

18. *Chee.*—Trees or wood. See the Cakchiquel month *Pariche.*

THE CHAPANEC CALENDAR.

The Chapanecs of Chiapas, belonging to a linguistic stock wholly different from the Mayas, Nahuas or Zapotecs, also made use of this Calendar. This we know from the fact that they counted 18 months to their year, each of twenty days, and allowed five intercalary days, called *nbu*, precisely as did the Nahuas and Mayas.

It is peculiarly unfortunate that we have not the names of their days, and those of their months are preserved in a sadly imperfect manner. Mr. Alphonse Pinart has published two lists, both incomplete, at the close of his edition of the *Arte de la Lengua Chiapaneca*, of Fray Juan de Albornoz; but they do not seem to have constituted a part of that work; at least they are not in the MS. copy of it in my possession.

It would not be difficult for a person acquainted with the climate and routine of culture pursued by the Chapanecs to construct from these two lists one which would be accurate and complete, but as I do not possess that knowledge, I give them as they are, so as to complete this portion of my study. I add, in some instances, possible derivations, from the MS. Chapanec Vocabulary of Dr. Berendt, but in most cases the etymology of the names is quite obscure.

Months of the Chapanec Calendar of Chiapa.

1. May 15. *Tumugûi*, or *Tamugûi*.—"Chile is sown." Begins May 15.
2. June 4. *Iatati*, or *Hatati*.—"The winds begin."
3. June 24. *Ñumbi*.—"Maguey is sown."
4. July 14. *Cutamé*.—"The weather changes."
5. August 3. *Iaumé*, or *Haumé*.—"Dampness."
6. August 23.
7. September 12. *Majua*, or *Mahua*.—"Cold."
8. October 2.
9. October 22.
10. November 11. *Mua*.—"Camotes (batatas) are planted." In Chapanec these are called *nua*.
11. December 1. *Tupiu*.—"The dampness increases." Probably from *tipi*, mist or fog.
12. December 21. *Tuhu*, or *Tujiu*.
13. January 10. *Muhu*, or *Mu-u*.—"Mosquito time."
14. January 30. *Turi*.—"Ripeness."
15. February 19. *Manga*.—"Time for little fishes" (fish, *nangasi*).
16. March 11. *Puri*.—"The jocote ripens" (jocote, *luri*, *Spondias edulis*).
17. March 31. *Cuturi*.—"The jicalpestle (gourd) ripens."
18. April 20. *Cupané*.—"The coyol (*Bactris vinifera*) ripens."

Months of the Chapanec Calendar of Su-Chiapa.

1. June 4. *Yucu*.
2. June 24. *Ñumbi*.—"Maguey is sown."
3. July 14. *Muhu*.—"Mosquito time."
4. August 3. *Hatati*.—"The winds begin."
5. August 23. *Mundju*.—"Chile is sown."
6. September 12. *Catani*.—"The rains cease. Maize begins."
7. October 2. *Manga*.—"Fishing begins."
8. October 22. *Haomé*.—"Rivers fall, and fish leave."
9. November 11. *Mahua*.—"Cold begins."
10. December 1. *Toho*.—"No planting done."
11. December 21. *Mua*.—"Camotes are planted."

12. January 10. *Topia.*—"The dampness increases."
13. January 30. *Tumuhu.*—"Nothing is done."
14. February 19.
15. March 11. *Cupamé.*—"The coyol ripens."
16. March 31. *Puri.*—"The jocote ripens."
17. April 20. *Puhuari.*
18. May 10. *Turi.*—"Time of ripening."

§ 13. The Symbolism of the Day Names.

Whatever other uses of an astronomical and time-measuring character the Calendar had, the best known and most general service which it rendered was for divinatory purposes. Indeed, early writers, such as Sahagun and Cordova, assert that the ritual Calendar of 260 days was confined to this object.

Unfortunately, they have not left us precise details. For in spite of a large amount of desultory information in their works and those of other early writers, the basic theory of the art of divination, according to this Calendar, is nowhere stated. I propose to offer a suggestion as to what this was, as appears to be indicated by the Calendar itself, and to be supported by a number of collateral facts mentioned by early authorities.

The period of 20 days, each bearing its own name, was certainly derived from the vigesimal system of counting. This was in use in precisely the same manner in all those of the linguistic stocks under discussion. In all, the unit of the higher integers was 20.* This multiplied again by 20 gave 400, and this again by 20 gave 8000, which in each was the highest number for which they had a single expression.

This number 20 was based on finger-and-toe counting, and so clearly was this reflected in the languages that in Nahuatl it bore the name *cem poualli*, "one (whole) count;" in Tzental *hun vinic*, "one man;" and in Quiché and Cakchiquel, *vinak*, "a man" (homo). The Maya *kal*, and the Zapotec *cal-le*, appear to have the signification "completed," "filled up," referring to the completed count of fingers and toes.

In this manner the number 20 came to represent symbolically

*The vigesimal (quinary-vigesimal) system obtained in most of the stocks of Mexico, Central America and Northern South America. North of Mexico it is rarely found, as among the Tlinkit and Pawnees. Elsewhere the decadal plan is in vogue (see Müller, *Grundriss der Sprachwissenshaft*, Bd. ii, Ab. i, s. 183).

the whole of man, his complete nature and destiny, and, mystically, to shadow forth and embody all the unseen potencies which make or mar his fortunes and his life.

I have already spoken of the various theories to account for the 13-day period. Whatever one we accept, I am persuaded that this period was posterior and secondary to the 20-day period. At any rate, it was distinctly so regarded in the divinatory systems. Cordova, speaking of the Zapotec Calendar, which was certainly the most primitive in form, tells us that each of the 20 signs had not only 13 numbers each, but 13 names, or rather 13 varieties of the same name.*

In the region of the Tzentals, Bishop Nuñez de la Vega describes as a common figure in their books of divination the demon *Coslahuntox*, who was painted in a sitting position and with horns on his head, his name meaning "the demon with 13 powers." †

In this garbled account we must correct *Coslahuntox* to *oxlaghun tox*, "the thirteen divisions" or "parts;" ‡ and the "horns" to the plumed headdress of quetzal or other feathers.

Just such seated and crowned figures are found on sculptures from the ancient cities of Ocozingo and Palenque, in the territory of the Tzentals; one from the latter seated on a double-headed tiger, and another from the former where the tiger is conventionalized into an elaborately carved block of stone. § These, and others like them, represent the divinity of the day, seated with empty hands to show that he is a ruler and is not required to labor, precisely as the early missionaries tell us was the native idea of sovereignty among those peoples. ‖

* "Cada uno de aquellos animales que eran veynte tenia trece nombres, y aunque todos estos trece nombres eran en si como una cosa, diferenciavanlos con les añadir ò quitar letras." Cordova, *Arte de Lengua Zapoteca*, p. 203.

† "Al que llaman Coslahuntox (que es el demonio, segun los indios dicen con trece potestades) le tienen pintado en silla y con astas en la cabeza como de carnero." Nuñez de la Vega, *Constituciones Diocesanas*, p. 9.

‡ The Tzental verb *q'tox* means to divide, to separate, to split. See above, note to page 281.

§ The figure from Ocozingo is given by E. G. Squier in his *Observations on the Chalchihuitl of Mexico and Central America*, p. 11 (New York, 1869). The bas relief from Palenque is familiar from the works of Stephens, Charnay and others. In the Museum of the Trocadero, Paris, are several small seated figures of a similar character, some bearing a day sign upon. They were collected by M. Pinart in Tzental territory, and have by some been remarked upon as similar to the seated statues of Buddha. I take them to be of the same class with the images just mentioned.

‖ See the remarks of Father Coto in his *Diccionario de la Lengua Cakchiquel*, which I quote in my *Essays of an Americanist*, pp. 115, 116, note (Philadelphia, 1890).

That the same allocation obtained among the Nahuas is testified to by Sahagun, whose words are, speaking of the divinatory Calendar: "It was composed of 20 signs. . . . . To each sign were allotted 13 days." He adds: "This method of divination has nothing to do with natural astrology, or the movements or aspects of the planets, but takes as its point of departure certain signs and numbers which are not derived from natural phenomena, but must have been invented by the Devil himself." "They asserted this system was a divine revelation from Quetzalcoatl; it consisted of 20 signs, each multiplied 13 times."*

This writer dilates more than any other on the details of the Nahuatl divinatory system, but leaves his readers in the dark why the individual signs were chosen, or what their relation to each other and the general system was supposed to be.

I do not pretend to be able fully to supply this regretable lacuna in our knowledge of the philosophy of these ancient nations. But I believe that their system was in a certain sense philosophic; that it grew out of ripe meditation on the agencies which direct and govern life; and that it was merely veiled—not smothered—in the symbolism which has been transmitted to us, and which they found it convenient to throw around it, in presenting it to the unlearned.

The 20 potencies or agencies, fixed at that number for the reason above given, follow each other in the sequence in which they were believed to exert their influence on the life or existence not of man only, but of things and of the universe itself. This opinion exerted a strong constructive and directive influence on the national myths, rites, and symbolism, extending to architecture and ornament, to details of government, and to the everyday incidents and customs of national and domestic life. In all of these we perceive a constant recurrence of the signs and their correspondent numbers, drawn from the composite relations of 20 : 13.

Turning to the symbolic meaning which may be discovered in the signs and names of the twenty days, I shall examine each briefly:

Day 1.—The Swordfish, Crocodile, Spiderfish or other "Marine Monster."

According to the Codex Fuenleal, at the beginning of things the gods made thirteen heavens, and beneath them the primeval

*Sahagun, *Historia de la Nueva España*, Libro iv, *passim*.

water in which they placed a fish called *cipactli* (que es como caiman). This marine monster brought the dirt and clay from which they made the Earth, which therefore is represented in their paintings resting upon the back of a fish.

This sign, therefore, signifies the material beginning of existence or life in the Earth or in the individual, the substance into which it is shaped.

The *cipactli* was an entirely mythical creature, and was not intended to represent any known species.* Therefore any curiously shaped fish was selected. The word has been variously interpreted, but none of the renderings seems appropriate.† I would suggest that it is a compound of *ce*, one the whole, and *patia*, to liquefy, to become water, which is in full concordance with the native myth of creation above referred to.

Day 2.— Wind or Air, Breath, Spirit, Soul.

In American symbolism air or wind constantly signifies the immaterial life, that which exists apart from physical substance.

The first two of the twenty symbols therefore point to the double origin of being conceived as matter and spirit, body and soul, extension and thought.

Day 3.—Night, Darkness, the House.

The symbolic idea underlying these signs is that of repose. Night is the time for sleep, the house is the place of rest, darkness suspends labor and relaxes effort. Old age and the harvest close, the one the activities of the career, the other the toil of the agriculturist.

Day 4.—The Lizard, the Iguana.

The flesh of the iguana was a favorite article of food, and the animal was taken as the symbol of nutrition and abundance. Among the Pipils the god of maize and the food supply presided over this sign and its signification was plenty and fullness.‡

* This is also the opinion of Orozco y Berra, *Hist. Antigua de Mexico*, Tom. i, p. 54.

† Several may be found in Boturini, *Idea de una Nueva Historia General*, p. 46.

‡ Nuñez de la Vega, *Constituciones Diocesanas*, p. 10, and *Codex Telleriano-Remensis*, Lam. xiii (in Kingsborough's *Mexico*).

Day 5.—The Serpent.

Dr. Seler thinks that the signification of this symbol is poverty or want. According to Pedro de los Rios, however, the serpent, in Mexican symbolism, represented especially the phallus and therefore the reproductive force, the sexual life.* Of course, here as in other symbolisms, this animal conveyed many other meanings; but there is reason to suppose this was the one especially intended in this relation.

Day 6.—Death, the Severed Head, the Skull.

The chief signification of this sign illustrates the notion of "counter-sense" which so often occurs in language, mythology and folk-lore. Modern dream-lore says that dreams before midnight "go by opposites," that is, they must be taken opposite to their obvious purport. This theory of contrasts is based on some idea of compensation, or else on that of esotericism, which "least does mean, what it most does show."

In accordance with this plan, the meaning of this sign in Nahuatl symbolism was chiefly, not death, but birth. The goddess of parturition, Tonacacihuatl, was patroness of the day; and the snail shell, typical of the womb (for out of it, as the snail from its shell, emerges the neonatus), was her emblem; to which may be added the sad and close connection which often exists in child-bearing between birth and death (of the mother).

The intimate relation of this to the preceding sign, and the natural sequence thus established, will be evident.†

Day 7.—The Deer.

The signification of this symbol is obscure. According to some of the interpreters, it meant drought; but its patron among the Aztecs was Tlaloc, the god of the rains. The Nahuas of Nicaragua, on the other hand, explained this sign as representative of success in hunting.‡

* De Rios, in his notes to the Codex Vaticanus, in Kingsborough's *Mexico*. The phallus was a prominent object of worship in ancient Mexico. See Tayrayre, *Explor. des Regions Mexicains*, p. 233, and other modern authorities.

† The contrasted meaning of this sign is fully recognized by Dr. Seler (*Aztek. und Maya Handschriften*), though he fails to see its relation to the sign preceding it.

‡ Oviedo, *Historia de Indias*, Tomo iv, p. 55.

Day 8.—The Rabbit, the Seed, the Flower Garland.

As the former sign seems to indicate fortune in the chase, so does this one in cultivating the fields. The figure in the full moon was called by the Nahuas "the rabbit;"* the animal also symbolized ease, idleness, and especially drunkenness. The god of drunkards bore this name.† This, however, must have been a later application, as the intoxicating pulque was known in but a limited area and probably its invention was much later than the adoption of the sign.

This and the previous sign seem to refer to the two chief sources of the food supply, hunting and agriculture.

Day 9.—Water, Thunder-storms.

The rains may be regarded as the agents of productiveness and the creators of fertility; or, on the other hand, as those which bring gloomy, sunless days, dampness, chilliness, rheumatic pains, coughs and disease. The thunder terrifies, the lightning destroys, the floods overwhelm.

It is from the latter aspect that water is contemplated in this sign. It represented sickness and desolation. Hence, among the Nahuas, it was deemed ominous of evil and its patron was the yellow-visaged god of fire, Ixcocauhqui, indicative of its desolating portent.

Day 10.—The Dog, the Stealer.

The dog among the Nahuas was held in small esteem, and was badly treated. "A dog's life," with them, as with us, meant a miserable one. Their verb *itzcuinizcaltia*, "to be brought up like a dog," conveyed the same ideas of bad treatment and hardship that the phrase does among ourselves. A very common locution in Nahuatl to signify affliction is *in tetl, in quahuitl*, "with stick and stone," as one treats a dog.

The dog was closely associated with the notion of death; the Nahuatl patron of the day was the god of hades, Mictlantecutli, and he was painted with a man in the last stages of misery fol-

* As do now the common people of India and some Mongolian tribes. See Grimm, *Teutonic Mythology*, p. 716 (Eng. Trans.).

† See my *Sacred Songs of the Ancient Mexicans*, p. 61 (Philadelphia, 1890), for an illustration of the "Totochtin," or rabbit gods of drunkenness and a hymn to them taken from the unpublished MSS. of Father Sahagun.

lowing him. The animal holds the same relation in the Maya hieroglyphs.*

The sign of the dog, therefore, denoted hardship and suffering.

Nevertheless, by the concurrent testimony of Sahagun and Duran, both this and the following day sign were deemed peculiarly prosperous and fortunate. Children born on them would arrive at positions of dignity and importance and shed lustre on their families. The notion would seem to be that such would overcome all difficulties.

Day 11.—The Monkey.

The monkey, like the dog, was a domesticated animal among some of the Nahuatl and adjacent tribes. Father Sahagun narrates the artifices adopted to catch them while young for the purpose of taming them.† There seems a purpose in placing these two domestic animals side by side in the Calendar. They were both highly auspicious signs, and indicated successful contest with obstacles.

Day 12.—The Broom, Teeth or Points.

The twisted brush of mallinalli grass or of the sharp *itztlaitl* was probably the symbol intended by this sign, whether referred to as "the thing twisted," or "the thing with many points."

Its meaning is obvious. As that which is swept away is dirt and dross, lost to sight and discarded, it has been recognized by most of the old writers that the significance is the evanescence, the transitory character, of earthly possessions.‡

Day 13.—The Reed or Cornstalk.

In Tzental and Maya it is distinctly the dry and dead cornstalk, *cagh-ben*, which corresponds to the Nahuatl patron of the day, the god of cold and dryness, Itztlacoliuhqui.§ The sug-

*See Dr. Schellhas' observations and references in *Zeitschrift für Ethnologie*, 1892, pp. 119, 120.

†*Historia de Nueva España*, Lib. xi, cap. i, sec. 5.

‡"Symbol der Vergänglichkeit, Unhaltbarkeit, des Dahinsterbens." Seler, "Das Tonalamatl," in *Compte-Rendu* of the Congress of Americanists, Eighth Session, p. 591 (Berlin, 1890).

§Literally, "pinched or bent with cold," applied also to a peculiar headdress designating this. Sahagun, *Hist. de Nueva España*, Lib. ii, cap. xxx. I prefer the derivation of this word from *itztic*, cold, as given by Siméon, to the more remote one from *itztli*, obsidian, offered by Seler.

gestion distinctly is of advancing years with the loss of the vital warmth of youth.

Day 14.—The Tiger (Jaguar), or Sorcerer.

According to the *Annals of Cuauhtitlan* the tiger symbolized the nocturnal heavens dotted with stars as the jaguar skin with spots.* That this was the significance of this day sign receives added probability from a figure in the Codex Borgia, where the goddess of the sign is accompanied by a picture of the moon and the night sky sown with star-points.†

The moon and the stars were the especial field of study of the seers, the sorcerers and the wise men; hence the underlying meaning of the sign was occult or mystical knowledge.

The especial constellation known to the Nahuas as *ocelotl* was the Great Bear; it mythically represented the god Tezcatlipoca deposed from his position as the sun god, and falling into the sea.‡

Day 15.—The Eagle, the Bird, Knowledge.

In the Nahuatl symbolism the eagle, *quauhtli*, is generally understood to mean "war." But this sign in the other languages would seem to stand for knowledge or skill.

Day 16.—The Vulture, or Owl.

According to the Nahuatl interpreters, this is the sign of old age, of long life, derived perhaps from the bald head of the vulture. The owl in all these nations was regarded as a bird of evil omen. We may understand the reference in both to be to the infirmities and losses of old age.

Day 17.—Strength, Motion.

The idea apparently conveyed by this sign is the disastrous results of strength exerted. It is in the myths connected with earthquakes, eclipses and the end of the world, and its representations portray death, human sacrifice, and destruction. The

* See *Anales del Museo Nacional de Mexico*, Tom. ii, p. 254.

† Given by Dr. Seler, *Aztek. und Maya Handschriften*, p. 25, who, however, derives a different meaning from it.

‡ See Orozco y Berra, *Historia Antigua*, Tom. i, cap. ii.

motion is the shaking, tottering movement of the paralyzed or the aged, or that of the earth in its convulsions.*

Day 18.—The Flint Knife.

What is intended is the sacrificial knife or the spear point, stained with blood as an instrument of death. The suggestion is death in war, or as a victim.

Day 19.—The Lightning.

In this sign the thunder-storm was considered as the begetter of sickness, and, like water, as portrayed under the ninth day sign, the maleficent effects of the thunderbolt, the pouring rain and the floods were those intimated. The interpreters considered it, therefore, a day of evil omen.

Day 20.—The Chieftain, the Flower.

As previously stated, the real symbol of this day was the sun. This is to be understood in its mythical sense as the haven of life, the place of repose of souls, the resting place of the dead; as I have stated in general terms in a previous work, "The home of the Sun is the heaven of the Red Man."† This is true all over the continent, and there is a peculiar significance in finding it borne out by the symbolism of this remarkable Calendar.

§ 14. General Symbolic Significance of the Calendar.

Restoring the figurative terms to their literal meaning, we may conclude that the general and original symbolism of the day names in all the tongues in which we have them were as follows:

Day.	Symbol.	Hieratic Significance.
1.	Swordfish.	Birth, the beginning.
2.	Wind.	Breath, life, the soul.
3.	Darkness, the house.	Sleep, rest, repose.
4.	Iguana.	Food, nourishment.
5.	Snake.	Sexual life, reproduction.

*The present (the fifth) age of the world, according to Mexican mythology, was expected to end in this sign. *Codex Telleriano-Remensis*, Lam. x.

† See my *Myths of the New World*, Chap. ix, for abundant testimony on this point.

Day.	Symbol.	Hieratic Significance.
6.	Death.	Child-bearing, children.
7.	Deer.	Hunting.
8.	Rabbit, seed.	Agriculture.
9.	Water, rain.	Illness (or, productiveness).
10.	Dog.	Hardship and suffering (success through them).
11.	Monkey.	Difficulties surmounted.
12.	Broom, teeth.	Loss, evanescence.
13.	Reed.	Cold, drought, advancing years.
14.	Tiger.	Learning, wisdom.
15.	Eagle, bird.	Knowledge, skill.
16.	Vulture, owl.	Old age, misfortunes.
17.	Motion.	Debility, failing powers.
18.	Flint knife.	War, death.
19.	Lightning.	Sickness, destruction.
20.	Sun.	The house of the soul.

An examination of this sequence here exhibited, which is in the main accurate, though doubtful in some specifications, reveals that it was intended to cover the career of human life, from the time of birth until death at an old age.

The individual emerges from the womb of his mother and the parturient waters, as did the earth from the primeval ocean; he receives breath and with it life, which is supported by repose and food. The man reproduces his kind; the woman, at the risk of death, brings her child into the world. The chase and tilling the ground are the leading occupations of peace, and he who holds firm through illness, suffering and hardships, will gain the prizes of life. Having reached the acme of his career, the decline commences. Losses multiply, years increase, and though knowledge and wisdom are augmented, old age comes on apace with failing powers, with vanquished struggles, with sickness and death; until at last, its course run, its task completed, the soul quits the worn-out body and soars to its natural haven and home, the abode of the Sun.

Such, it seems to me, without any straining, is the philosophical conception of life which was intended to be conveyed by the symbols of this strange old Calendar. They may not have originated contemporaneously with it; certainly not, if it was primarily deduced from astronomical observations; but quite probably, if, instead of this, it was built on terrestrial relations and mythical concepts.

PROC. AMER. PHILOS. SOC. XXXI. 142. 2 N. PRINTED DEC. 7, 1893.

In the twenty headings under which the agencies which influence human life were arranged, the ancient seers believed they had exhausted the arithmetical unit which stood for the completed individual—his vigesimal equation and correlate; in the thirteen modes of activity which they assigned to each of these agencies, they had taken into account the thirteen possible relations of each to both the material and immaterial worlds; and the fact that the result of 20×13 expressed in days gives approximately nine lunar months, the period required for the unborn babe to pass through its evolution from conception to birth—a period perfectly familiar even to the wild hunting tribes—gave them whatever needed confirmation they wished for the mystic potencies of these cardinal numbers.

The Great Mesozoic Fault in New Jersey.

By Benjamin Smith Lyman.

(*Read before the American Philosophical Society, September 15, 1893.*)

Great faults, the ever-ready, easy resource of geologists to cover up their own deficiencies or mistakes, have, without any substantial proof, been liberally conjectured again and again to account for what has been supposed to be a wholly impossible apparent thickness of the older Mesozoic rocks of New Jersey. For those rocks have, from their conformability throughout, and their predominant color and a comparative lack of fossils through a great part of them, been commonly lumped together as only a single group, formation, or system, under the general name of New Red, or Triassic, or Jurassico-Triassic, or Rhaetic. Nearly forty years ago, with the bold assurance born of ignorance, perhaps quite pardonable at that time, the special name of Newark group was proposed for the whole lot, from one of its most striking local economic features, though otherwise an extremely subordinate one, and even economically perhaps inferior to the Richmond coal; and latterly there has been an effort to revive the name, long after it had fallen into well-merited oblivion. The assumption has been: the whole series is but one formation; one formation can be no more than about 5000 feet thick; therefore, the whole series is at most 5000 feet thick.

It now appears, however, from recent researches in course of publication by the Geological Survey of Pennsylvania, that the total thickness of the so called New Red does incontestably far exceed the thickness

usually given to any single formation; but, on the other hand, that there is no sufficient reason yet to believe that all the rocks do belong to one paleontological group or formation. The comparatively few fossils found have hitherto been ascribed indiscriminately to the whole so-called formation, without any exact knowledge of the relations of beds of different localities to one another. Perhaps too great reliance has been placed in the capacity of fossils to indicate the geology of a vast series of beds in great measure devoid of them; and the more laborious, purely geological methods of combining numerous observations of dip, strike and elevation, with the help of topographical indications, have long been neglected, because there was likely to be no sufficient immediate economic return.

At length, however, the series has been practically worked out by proceeding throughout from one exposure to another near it; instead of simply assuming a nearly constant dip in one northwesterly direction and estimating the consequent total thickness from the whole breadth of the region filled by the beds. It has now become possible to ascertain from what part of the series the different fossils of the region have come, at least in Eastern Pennsylvania; and it is seen that nearly all of them have in reality been taken from one small portion, although they have been supposed to indicate the age of beds many thousands of feet above or below. It is also seen that the geological structure is not so extremely simple as it was formerly supposed to be; and that no set of straight parallel faults could have diminished to the desired extent the apparent thickness of the series of beds in Eastern Pennsylvania, for the beds curve strongly and extensively in many directions.

It has, however, long been known that, in the midst of the New Red there, an island, so to speak, of ancient Paleozoic rocks occurs. It was never certainly known, to be sure, whether it was really an island in the New Red sea, with New Red beds of equal age north and south of it; or had later been thrust up through the New Red beds (or remained fixed while the New Red beds on the south sank down), so as to occasion a great disparity in the age of the beds of the two sides. Now it is positively known that there is such a great difference, and that the New Red beds to the south are several thousand feet higher in the series than those on the north. The line of the southern edge of the ancient island continues westward as a great fault; but far from parallel to the strike, and consequently not helping much, if at all, to diminish the great apparent thickness of the New Red. The fault is there the more obvious from a marked difference in the color of the rocks on its two sides.

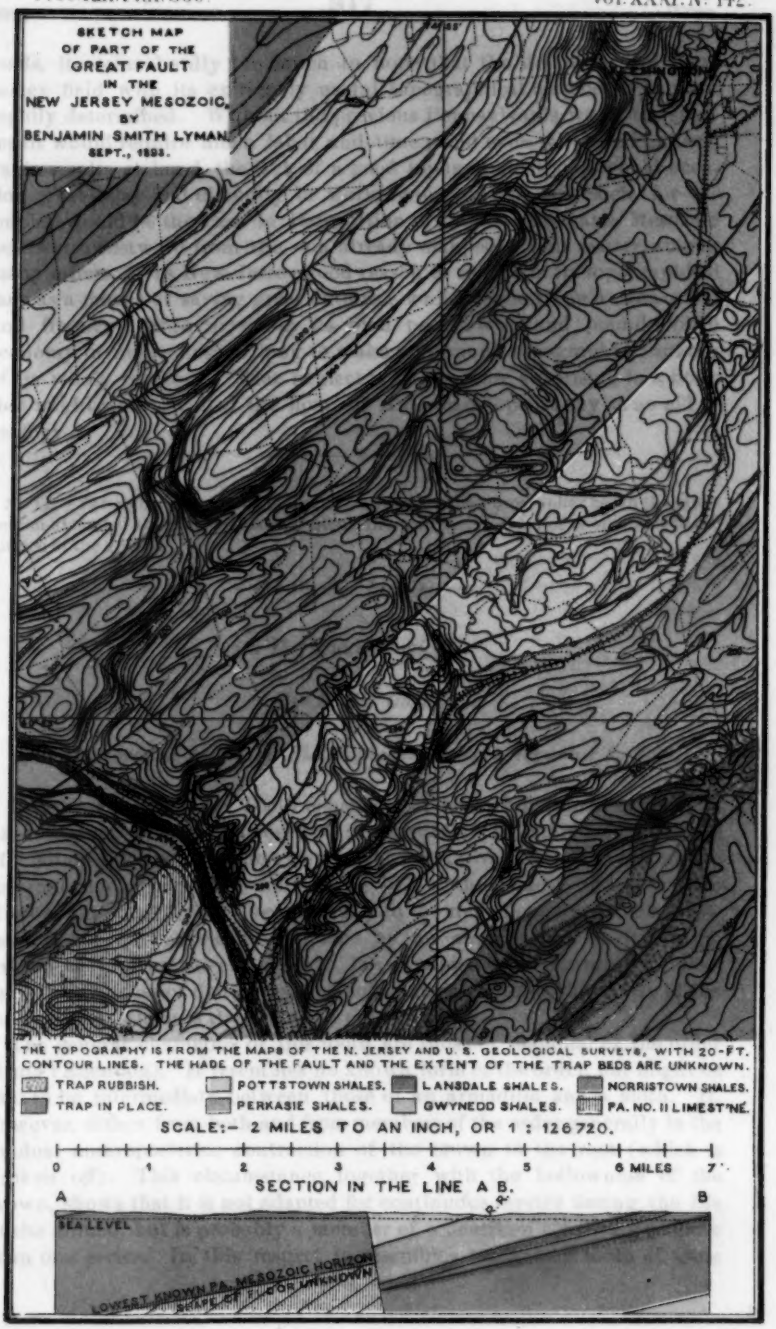
But at the eastern end of the island of ancient rocks, just in the edge of New Jersey, the circumstances are somewhat different. There the strike of the beds on the northwest and on the southeast is nearly the same; and, moreover, the beds of both sides are mainly red; and they are, besides, in general rather soft shales. Consequently, without the proof given by the observations in Pennsylvania, or perhaps by some not yet made in other parts of New Jersey, it would be extremely difficult, if

not wholly impossible, to detect, still more so to prove, the existence of the fault, in spite of its great throw of over fourteen thousand feet.

The accompanying sketch map shows, at least roughly, the prolongation of the fault nine miles northeastward into New Jersey and of equidistant strike curves, a thousand feet apart in level, on the bottom of different sets of Mesozoic shales north and south of the island-like mass of Paleozoic limestone, of Pennsylvania formation No. II, from the positions determined west of the Delaware by the recent survey. It has been possible to make, roughly, the prolongation of the lines without observing any rock exposures in New Jersey; because the topography shows the geological structure very distinctly on the north of the fault, and with some clearness on the south. On the north, the long straight hills and valleys show very plainly that the strike of the rocks continues almost straight northeasterly in the same general course as on the Pennsylvania side of the Delaware, and nearly parallel to the fault, but gradually bending more to the north. South of the fault the strike as shown by the topography, though not very far from parallel to the fault, is evidently decidedly less straight in the western edge of New Jersey, as it is also in Pennsylvania; but farther east becomes for a space straighter and more closely parallel to the fault and to the northern strike. This structure of the southern shales is confirmed by the topography outside the limits of the map.

The shales on the north of the limestone and fault belong to the same set of beds, mostly soft shales as those near Norristown, and near Yardleyville; while those next south of the limestone and fault are of the set of likewise red, mostly soft shales that is seen near Pottstown, overlying the couple of thousand feet of generally harder and in good part greenish shales of the Perkasie tunnel and its neighborhood, that themselves rest on the red shales of Lansdale. The trap masses given are copied from the New Jersey State geological map, except that the limits of solid trap in place have been conjecturally restricted, according to our experience in Pennsylvania, to only a portion of the whole space covered by blocks of trap and its decomposed earth.

It is very interesting to see how clearly the mere topography shows the geological structure, and so in conjunction with the ascertained relations of the beds north and south of the limestone, makes the presence of the great fault in New Jersey to be known with certainty, in spite of its otherwise thorough concealment through the similarity of the northern and southern shales and of their strikes. The topography, indeed, gives good indication of the geological structure far beyond the limits of the little map, and would perhaps do so through all the New Jersey portion of the older Mesozoic, in spite of the less pronounced variation in character of its beds as regards hardness than what we find among Paleozoic rocks. Now that the older Mesozoic series of beds has been so fully worked out in Eastern Pennsylvania, with several subdivisions of such different color and texture as to be very noticeable in traversing country


SKETCH MAP
OF PART OF THE
GREAT FAULT
IN THE
NEW JERSEY MESOZOIC.
BY
BENJAMIN SMITH LYMAN.
SEPT., 1893.
THE TOPOGRAPHY IS FROM THE MAPS OF THE N. JERSEY AND U. S. GEOLOGICAL SURVEYS, WITH 20-FT. CONTOUR LINES. THE HADE OF THE FAULT AND THE EXTENT OF THE TRAP BEDS ARE UNKNOWN.
TRAP RUBBISH.
TRAP IN PLACE.
POTTSTOWN SHALES.
PERKASIE SHALES.
LANSDALE SHALES.
GWYNEDD SHALES.
NORRISTOWN SHALES.
PA. NO. II LIMEST'NE.
SCALE:- 2 MILES TO AN INCH, OR 1 : 126720.
0
1
2
3
4
5
6 MILES
7
SECTION IN THE LINE A B.
A
B
SEA LEVEL
LOWEST KNOWN PA. MESOZOIC HORIZON
SHAPE OF FAULT OR UNKNOWN

roads, it seems hardly too much to hope that the details of the New Jersey field with its extremely useful topographical map could be very rapidly determined. Without the previous Pennsylvania work, the same result would require much labor and time ; and even with the Pennsylvania results at hand, the lack of a good topographical map would occasion great delay and difficulty in working out the details. Such, for example, would be the case in the portion of the Pennsylvania Mesozoic field southwestward from the one already mapped. This matter, among many others, gives New Jersey good reason to rejoice in its topographical map as a means of saving great outlays ; while Pennsylvania cannot but find frequent cause to regret its own penny-wise and pound-foolish economy in neglecting so long to make a thorough topographical survey of its whole territory. That neglect is all the more surprising in a State that might well be called the home of American topography as an aid to geology.

NOTE.—Through a misunderstanding of instructions the lithographer has in the cross-section extended the trap rubbish all along the trap bed, instead of confining it to the surface of the ground.

On the genus Tomiopsis.

By E. D. Cope.

(*Read before the American Philosophical Society, November 3, 1893.*)

TOMIOPSIS gen. nov. Tooth consisting of a much flattened cylinder of hard dentine, which is enclosed in cementum. The latter forms a layer of medium thickness on the external side, and a very thick layer on the internal side, which does not extend below the middle of the length. Crown compressed, tapering gradually to the root, the external face separated from the convex interior face by an angle. Pulp-cavity large, extending to near the cutting face, but occupied near the middle (? normally) by a mass of dentine, which substance also forms the centre of the cutting face, which is thus concave on wear.

The general characters of this tooth are those of mammal of the order Bruta (Edentata). It resembles no known form of the order, but might be said to be intermediate between those of an armadillo and a sloth. It, however, differs from both and from members of the order generally in the gradual anteroposterior contraction of the crown to the root (which is broken off). This circumstance, together with the hollowness of the crown, shows that it is not adapted for continuous service during the life of the animal, but is probably a member of a dentition consisting of more than one series. In this respect it resembles the incisor tooth of some

fishes, but it differs from all of these in the long crown without distinction of root, and in the thick cement investment.

Char. specif. Crown elongate, curved transversely to the long diameter of the grinding face. The latter is a little narrower than a semicircle, and the internal half of it consists of cementum. The dentinal plates form two cutting edges which are separated by a shallow valley of soft dentine. The two edges of dense dentine are in contact at one end of the grinding face, but leave an interval at the other, and both extremities of the external and shorter ridge are folded inwards, forming two loops. External face flat and smooth. Other surfaces also smooth. Length of tooth minus root, on external curve, 14 mm.; long diameter of grinding surface, 7 mm.; short do., 4 mm.; long diameter at broken base, 4 mm. I propose for the name of this species, *Tomiopsis ferruminatus*.

This animal left its remains in a bed of probably Neocene age, which is exposed on the Lapara creek in Western Texas. It was associated with scales of Lepidosteus, and bones of Trionyx and a tooth of a crocodile, which do not furnish an exact clue to the age of the formation. The specimens were obtained by Dr. E. T. Dumble, Director of the Geological Survey of Texas, and submitted to me for determination.

The Conservation of Osmazome in Roasting.

By Mr. R. Meade Bache.

(*Read before the American Philosophical Society, November 17, 1893.*)

Time was, and not so very long ago, when I should have hesitated about touching in this hall upon any subject related to cookery, despite the fact that we are by the Constitution of our Society devoted to the promotion of useful knowledge. But now, when the art of cooking seems to be beginning to receive some general recognition in this country, and is rising in some small measure to the dignity of a science, through expert articles in magazines and through departments of special schools, I need no longer fear that even here gastronomical discussion allied to dietetic good might fall upon unwilling ears.

In the days when I was a mighty hunter before the Lord, before I ceased to take satisfaction in killing for pleasure, when I shot deer on the mountain side, once at a safe distance at a retreating grizzly bear, and on another even followed a she one and two cubs towards their lair, without finding it, to which gracious dispensation I doubtless owe the honor of addressing this meeting of the Society, I made a casual observation in the pure air of the mountains whenever I came to cook an evening meal of venison. This was, of the exceedingly large development of osmazome on the roast. Reflection I did not at that time make on the subject. The

simple fact was then observed unreflectingly, to be later collated with other observed facts, from which in sum I drew the conclusion to which this paper points. Intermediately I learned (chiefly through Brillat Savarin's famous work on the physiology of taste) of the great gustatory value of osmazome as a culinary product, but without reference to its dietetic value. This, perhaps, it was that prompted me mentally to revert to my former mountain experiences, when I had seen osmazome developed to the highest degree of excellence that I have ever met, and thereupon other facts connected with the roasting and baking of meat fell into line, leading to the conclusion to which I have referred.

These facts resolved themselves finally into two coördinated ones, open to the observation of any one who has lived in a time which combined roasting meat with the Dutch-oven (sometimes called the tin-kitchen) and baking it in the ordinary household oven. We may observe in the three methods of cooking mentioned, that in the open air, that in the Dutch-oven, and that in the ordinary oven, two steps of degradation. What, then, makes the difference in their products, when the substances submitted to the heat, being essentially the same, can possess no difference in heat-ray selective capacity? It seems to me, obviously, to be caused by the diminution, in two of these processes, of the presence of pure air; that is to say, the deficiency of oxygen, with sufficient aqueous vapor, in association with these processes. Oxygen seems to me, for two reasons, to be the prime factor in the best effect, because that effect seems analogous to other effects in the presence of oxygen, and because nitrogen is recognized as a very inert gas. I do not believe that the effect would be produced at all in a vacuum. Stated in final terms, the perfect development of osmazome in roasting depends, in my view, upon the roast's being immersed in a copious and ever-changing bath of pure air, causing what may be termed oxygenation of the meat.

With the Dutch-oven, the air-bath is copious and changing, but it is derived from the kitchen, full of effete matter in suspension, and in a measure deoxygenated by breathing, and sometimes by artificial lights. With the ordinary oven, the same objectionable conditions, in lesser degree, attend the process of baking meat, but their diminution is more than compensated by the circumstance that all the waste products are for the most part confined within the narrow limits of the oven, and the juices of the meat evaporate, on account of the lack of moisture in the deficiency of aqueous vapor in the air. Hence we have, to take the extreme case, the average farm meat-product of the oven, with the osmazome of the exterior utterly destroyed in a black crisp, and even with the Dutch-oven, unless with ceaseless basting, a product far inferior to that of the Homeric method.

I need not pause to descant upon the value of osmazome as a constituent of meat, to be developed, not to be destroyed or impaired by the process of cooking. You are all aware that it consists of various principles, found sometimes even in vegetable substance, combined with empyreumatic pro-

ducts, and is, in sum, most succulent and wholesome for the gourmet, besides being excellent dietetically for the sick and convalescent.

Having had, through my particular course of life, an exceptionally good opportunity of seeing the average mode of cooking in the land, I can say without hesitation that I do not upon reflection consider my conviction at all exaggerated, when I state that its general cooking of meat, as being innutritious and wasteful, is barbarous, and for this reason I once bethought me of making a small contribution to the sum of knowledge of better things. With the conviction of which I speak in my mind, I thought, a few years ago, in 1887, to aid in the improvement of the art of cooking, at least among the well educated, whence the knowledge might spread, by devising an oven which should approximate in its function to the task of yielding the osmazome which a given piece of meat is capable of producing, in nearly the most perfect form of which the piece is susceptible. We must remember that we do not create osmazome by any process, and that its manifestation on the outer layers of meat subjected to the roasting or baking process does not represent all the osmazome in the piece, but merely that portion which has submitted to what Savarin aptly calls caramelization. Nevertheless, the proper caramelization on a piece of roasted meat is the outward sign of an inward grace. If the piece has been countrified, the outer layers are charred and the interior dried by long continued evaporation of the juices of the meat. If the piece is represented by the opposite extreme of treatment, the outside has never been allowed to become so hardened as to present a serious barrier to the penetration of heat to the interior; the outside is sapid, though crisp, and the interior shaded off from the outside by insensible gradations of rareness; the flavor of the whole surviving in the so-called juice, containing the active principles, osmazome and other extractives, that give delicious flavor. But the ordinary oven is not an instrument capable of effecting this result to a high degree; no existing oven is. Well adapted as the oven is to the drying of dough incidentally to the baking of bread, cake and pies, it is for that very reason, besides others, the poorest possible instrument in its present form wherewith to attempt to imitate a roast.

I fully realized that the course of cookery could not be turned backward in a land where the frying-pan still wields the sceptre against the invasion of the gridiron. I accordingly applied for a patent for an oven which depends upon the simple device of allowing a controllable stream of air, as pure as procurable, to pass through it while the process of cooking is proceeding. For the first time, however, in applying for a patent, I failed to obtain one. The objection made to my device by the patent examiner to whom it was, in the course of routine, submitted, was that it had been anticipated by some one who had invented a wire-gauze door for an oven. I have not, however, changed my opinion that the device does not conflict in the slightest degree with the other invention cited as preventing its acceptance. There are examiners and examiners, and some are not infallible, as I found out many years ago, when, having incidentally used, as a

detail to the production of a new thing, an article that happened to be in the market, an examiner decided against allowing a patent, upon the ground that the man who had invented the incidentally used article had invented it for all the possible uses to which it might in the future be applied ; an untenable proposition, easily disposed of upon appeal, by an argument that I made, supported, as witnesses, by Prof. Joseph Henry, Dr. Henry Morton, Mr. J. E. Hilgard, and General Meade.

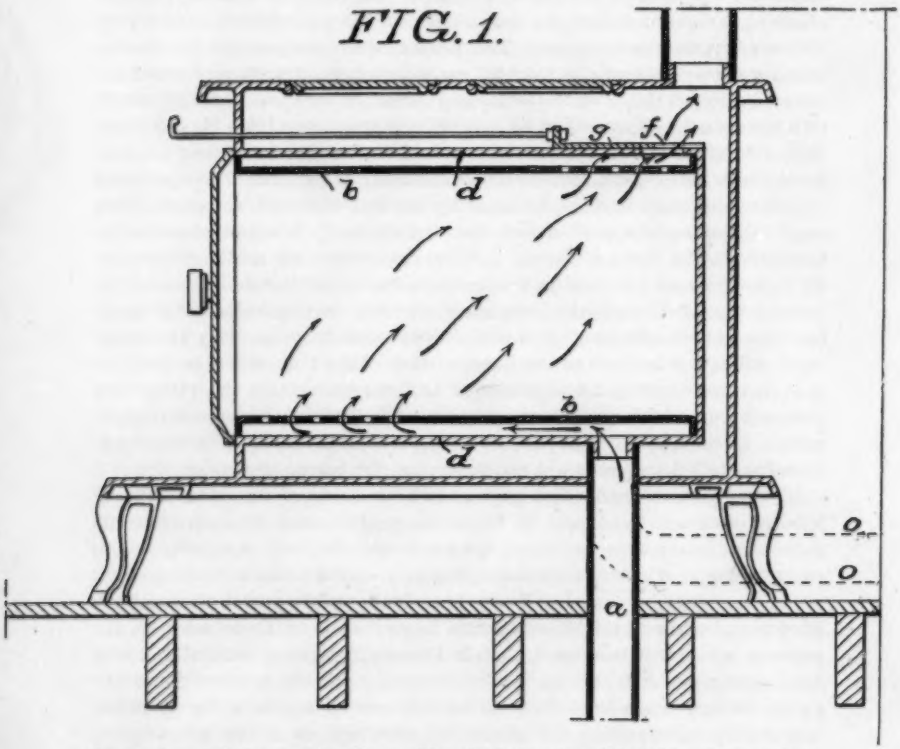
The validity of patentable invention depends upon two factors, the realization of an idea as embodied in an original apparatus. Thousands of men since Dædalus have conceived of the practicability in various manners of aërial navigation under the open skies, but the embodiment of the idea still remains undemonstrated. The person who invented the gauze-wire door for an oven certainly thereby made a step in advance towards culinary aëration of the oven for meat, and therefore a step in the right direction towards the oxygenation of it, whatever may have been his intention with reference to the result observable. But, even conceding his full intention in that regard, and the incontestability of the result, the apparatus is still a most imperfect one for securing the desirable end, so remote from anything but embryonic function, that it may justly be regarded as simply tentative in the right direction. When, moreover, we additionally consider that patents issue under the characterization of "improvements" in some designated category, containing thereby the implication that there can be no absolutely new invention, it is impossible to see why the apparatus which I submitted to the Patent Office of the United States does not at least come under the designation of an improvement on the gauze-wire door oven, of which my patent agents knew before they entered my application for a ventilated oven (the records always being consulted previously), and therefore could not have thought barred my claim.

If we are to concede that exposing the interior of an oven more or less to circumambient air, of whatever quality, and dependent for its movement solely upon radiation, then any one who ever purposely left an oven door ajar while meat was cooking in it, made to the wire-gauze door an approximate invention. Everything leaks to air and water. If the adoption of either method constitutes oxygenation of an interior, in the sense in which it is here used, then it follows that every natural and artificial cavity on earth can be deemed aërated, even the receiver of an air-pump, except one where there is no untraversed space in the cylinder, secured by surrounding the piston by mercury, as in the air-pump of Kravogl. Aërated and oxygenated, in a certain narrow sense, the oven with the gauze-wire door may certainly be considered to be, but in the true sense, which I had in view in my device, it cannot be considered effective. Such an oven receives from the kitchen all the effete products floating in the air. Its change of air, such as it is in amount, whatever it may be in quality, is only owing to the erratic flux and reflux primarily set up by radiation from the mouth of the oven. On the contrary, the device which I presented for the purpose defined admits the purest outdoor air at com-

mand, the flow of which is compelled to pass continuously around the meat in process of cooking, perfectly controlled by a simple and a single damper, the waste products being liberated into the chimney.

I will anticipate being ask why, if this be so, I have not prosecuted my claim by renewal of it. I reply that it is my intention to take that course when I have time. I still hope to give the first examiner, if he has survived the precariousness of office, or if not, his successor, an opportunity of enlightenment through further demonstration, and of change of mind as to the possibility of a claim to the invention of an oven, characterized by

FIG. 1.



the purity and the regular flow of its air, being invalidated by the previous invention of an oven with a gauze-wire door. If an examiner, whoever he may be, is not open to conviction on a point, then the appeal of a case to the Board of Examiners of the Patent Office is always open to the applicant.

The two diagrams on the blackboard represent the very simple device by which the object that I proposed to myself can be accomplished.

Figure 1 represents a longitudinal section of a modified cooking-stove, illustrating the device.

A pipe (*a*) is carried down from the oven of a modified cooking stove, through the floor, and into the cellar beneath the room in which the stove is situated; or where, because of the impurity of the air of the cellar, this plan is not available, the pipe (*a*) may be deflected, as shown by the dotted lines (*o*), and led to the open air through the walls of the room, or in any other convenient manner. In order that the air may be properly diffused and caused to circulate effectively, flanged plates (*b*) are fastened at top and bottom of the oven, between each of which plates and the oven-casing is enclosed a chamber (*d*). The bottom plate, it will be observed, is perforated at and near the front of the oven, and the top plate perforated at and near the rear, and in the top of the oven-casing (*f*) a discharge opening is formed, communicating with the chimney flue, the effective area of this opening being governed by means of the common form of sliding damper (*g*).

It will be seen that thus the volume of cool, pure air, entering the lower chamber (*d*), passes thence to the front, and then escapes into the oven through the perforations of the lower (*b*) plate, there taking the course of diffusion indicated by the direction of the arrows, until it finally escapes from the oven through the perforations in the upper (*b*) plate. It is evident that the perforations in the two plates may be so located as to compel the air to take any course desired through the oven.

It will be observed that, although the flow of air is, for convenience, represented by the diagram as taking place within a somewhat determinate line, yet that, in point of fact, the air entering the oven will, on account of its immediate and great increase of volume, expand into every part of the oven, and its consequent flow towards the upper vent will be from all lateral and inferior directions.

Figure 2 represents a modification of the device illustrated in Figure 1.

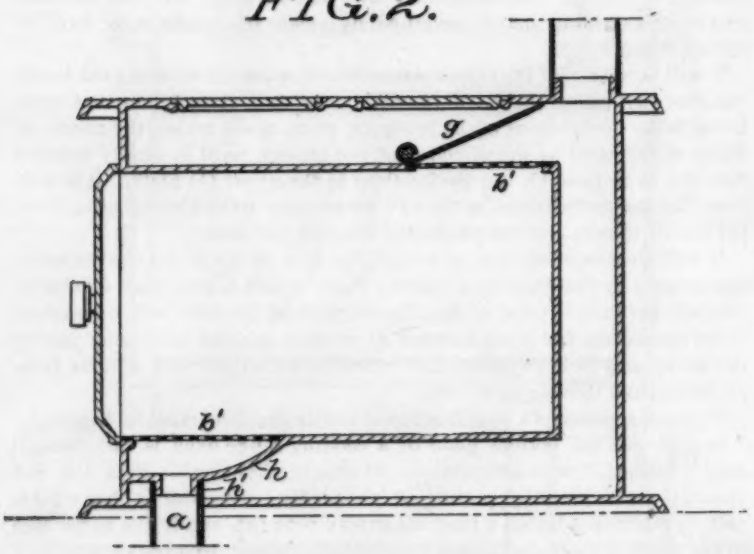
In this case the bottom plate of a cooking-range oven is cast, technically "dished," with a depression (*h*) near the front end. Both dish and opening are covered by perforated plates (b^1). The dish (*h*) has a neck (h^1), to which is adapted a fresh-air supply-pipe (*a*), and in the upper flue of the range is located a hinged damper (g'), turned from the outside by a crank-handle, by which the flow of air from the oven into the chimney-flue through the upper perforated plate may be governed.

If it be sought to approach or to rival the excellence of roasting, through the instrumentality of a ventilated oven, five conditions must be fulfilled. The air supplied to the oven must be pure, plentiful, continuous, well-distributed, and regulatable.

The movement of all air, whether free on the surface of the earth, confined in houses, or occupying lesser space, being dependent upon differences of density in different parts, and these differences of density being in turn dependent upon differences in the relative temperature of those parts, purity of air for a ventilated oven may be secured with all the other conditions as concomitants.

The source of supply may be through a conduit from the open air, or through one leading from a properly cemented and sanitarily kept cellar, the terminal of the conduit in either place being covered with metallic gauze to exclude dust. The air of a dwelling-house cellar should be as pure as that of the rest of the house. Hence it is a mistake in a furnace-heated house to draw for the air-chamber of the furnace, directly from outdoors, most of its supply. In a cellar properly regulated in every particular, the air from the furnace should be drawn from outdoors, mostly, if not entirely, through the intermediation of the cellar, thus searching and keeping sanitarily sweet its inmost recesses.

FIG. 2.



Rapidity of movement of the air for the oven, dependent upon differences of density, being secured by constituting either outdoors or the cellar the source of supply, ample amount of it is thereby necessarily involved. The ability to secure purity for this air being naturally associated with the means adopted to obtain ample movement, involving amount, it remains only to remark that continuity of the movement of the air is necessarily a concomitant of the other conditions, and to consider lastly the points of its regulation and distribution. The first of these ends is secured by the construction of the apparatus described, and the second by the employment of the single damper, as represented in the diagrams exhibited.

Whether the air, after having passed through the oven, shall be dis-

charged outdoors or into the chimney may be determined by household construction. That it should not be allowed to carry its effluvia into the kitchen is certain. Owing to the position in which cooking ranges are usually placed, it would, as a general rule, be most convenient for the air to find its way into a flue to the chimney. But its finding exit there has no especial advantage, physically speaking, over the other mode of exit, for the movement of air at any season of the year, dependent upon the differences of density between the air outdoors and that in the oven, would always afford superabundant volume, to be regulated by the damper, without adding to its updraught the great radiation up the chimney.

I have heretofore confined myself, as in duty bound, to the elucidation of the theme represented by the title of my paper. But it should not be inferred from my omitting discussion of anything beyond it, that I limit the good effect of the presence of ample oxygen in cooking to the preparation of meat for the table. On the contrary, I believe, as the result of observation, not experiment, that some vegetables, and therefore, I conclude, all, are so affected, and cook better in free air than elsewhere. In a qualified sense observation, however, is experiment, where work is done to the hand of one who has not opportunity to do it for himself, but seizes it in observing effects casually offered by that of others, and then combines the facts in conclusions.

A Vocabulary of the Nanticoke Dialect.

By Daniel G. Brinton, M. D.

(*Read before the American Philosophical Society, Nov. 3, 1893.*)

Among the valuable MSS. in the library of the American Philosophical Society is one, now a little over one hundred years old, which contains the only known vocabulary of any length of the Nanticoke dialect or language, once spoken in Maryland, on what is called the "Eastern shore," the region between Chesapeake bay and the Atlantic. Several requests have reached me from time to time to prepare this vocabulary for publication, and it seems to be a duty which the Society owes the republic of letters to make it available for purposes of study and comparison.

The vocabulary was collected at the request of a former President of this Society and of our country, Mr. Thomas Jefferson, by Mr. William Vans Murray, from an old woman called Mrs.

Mulberry, said to be the widow of the last chief of the Nanticokes. She at that time resided at Locust Neck town, Goose creek, Choctank river, Dorchester county, Maryland. The circumstances connected with obtaining the vocabulary are recounted in a letter from Mr. Murray to Mr. Jefferson, which is as follows:

LETTER FROM MR. MURRAY TO MR. JEFEERSON.

Dear Sir:—The enclosed little attempt to make a vocabulary of the language of the *Nanticokes*, may remind you of a circumstance, and promise of mine, which probably have escaped your memory. You gave me the printed list of words last spring. On the reverse of the printed side which is filled up, is added a number of words which occurred to me. The tribe has dwindled almost into extinction. It is still, however, possessed of five thousand acres of land which were reserved to them by the Assembly of Maryland in the first settlement of the Province. The little town where they live consists but of four genuine old wigwams, thatched over with the bark of the Cedar—very old—and two framed houses—in one of which lives the queen, Mrs. Mulberry, relict of the Colonel who was the last Chief. They are not more than nine in number: The others of the tribe, which in this century was at least Five hundred in number, having died or removed towards the Frontiers, generally to the Six nations—perhaps by a comparison of the languages of them and of those a correspondence may be discovered. They went to the Senecas often—you will find they have no word for the personals *he* and *she*. They were much at a loss for all terms to express abstract ideas. It is a little surprising they had a word for *Truth*. They speak their language exclusively among themselves. A few years must totally extinguish the remains of this Tribe and it will be owing to you, Sir, if a trace is left of their language.

I have preferred the very list which I filled in a Wigwam to any neater copy—and therefore have chosen that to transmit to you.

I have the honour to be
Dear Sir with great
respect and attachment

yr. mo. obt.,
W. V. MURRAY.

CAMBRIDGE DORSET, E. S. MARYLAND,
18 September, 1792.

THE HONBLE MR. JEFFERSON.

Mr. Albert Gallatin has made use of this vocabulary in his *Synopsis of the Indian Tribes of the United States*, and from time to time others have borrowed from it; but no effort has been made to publish it in full.

The Nanticokes are first mentioned by Captain John Smith, who encountered them in 1608. Their subsequent history does not offer much of interest. I have traced it in sufficient detail in my publication, *The Lenâpé and their Legends*, pp. 22–25 (Philadelphia, 1885).

A note to the vocabulary states that their last "King," "the famous Wyniaco," died about seventy-five or eighty years before (about 1712–15), and that "his body was preserved and very formally kept in a Awacason-house (Chio-ca-son house), seventy years dead," which means, I presume, for seventy years after his death. The preservation of the bones of their dead was a characteristic trait in the religion of the Nanticokes.

In publishing the vocabulary, I have thought it of interest to add comparative words from other dialects of the Algonkin stock, to illustrate how thoroughly the Nanticoke belonged to it. With a few exceptions, every word collected by Mr. Murray is seen to be a slightly varied form of some expression in Lenâpé or other adjacent dialect. The exceptions would probably fall into the same category were the analysis prosecuted further.

I have also thought it desirable to arrange the words in alphabetical order, for convenience of reference.

The exclamation point, !, so frequently introduced by Mr. Murray, he explains to signify a peculiar, forcible, explosive enunciation of the syllable.

At the close of the vocabulary, the writer adds the following proper names:

We ning go mi usk, the personal name of Mrs. Mulberry, "Mulberry woman" (see below, *Mulberry tree*).

Ama namp quun, the name of the Indian town of Locust neck.

Matt appenen, the name of the Nanticoke Indian town.

Vocabulary of the Nanticoke Dialect.

Abbreviations.—Len., Lenâpé; N. J., New Jersey Delawares; N. Eng., New England Indians; Chip., Chipeway; Pot., Potomacs; H., Heckewelder's Nanticoke Vocab.; Sh., Shawnee.

Air, *ayewash;* comp. wind, *ewesh;* Len. *geschen.*

Arm, *nickpitq;* Len. *w'nachk.*

Arrows, *allontz;* Len. *alluns.*

Arrowhead, *ik-ke-hek* (see "Spear").

Ash, *paw-kawque;* Sh. *mea-lawkuo.*

Autumn, *wee-saw-panu* (= *wees-wapanu*, little or short light).

Axe, *tummehek;* Pot. *tomahack;* N. J. *tomahickan.*

Back, *daduck-quack;* N. J. *huckun.*
Back-creek, *pomamato.*
Back-woods, *ah payw-wagh.*
Bad, *mattitt;* Len. *medhik.*
Banks, *lemoack-coi-um.*
Basket, *munnole;* N. Eng. *munnote.*
Bear, *winquipim.*
Beard, *nee-weeghtoniwaah;* Len. *ni-toney,* my beard; N. J. *ni-tuuna.*
Beaver, *nataque;* N. J. *nakuee,* or *tomoque.*
Beech, *pah!-scanemintz;* Len. *schauweminshi,* red beech-tree.
Bees, *aamook;* Len. *amoe.*
Belly, *nut-ah!* Len. *nachtey* (my).
Belt, *uckq-shit lawk;* Len. *ochquasu* (belt of wampum).
To bend, *ne wawk-kaw-quin-nimon;* Chip. *nin wakinan.*
Berry, *mee-cents;* Len. *mintschi.*
Bed, *dapp-in.*
Bird, *piss-seeques;* Chip. *binessi.*
Bitter, *wee-suck un.*
Black, *oaskag-u; uschkeju* H; Len. *sucken.*
Blackberry, *munck-qui-suck;* Len. *min,* berry; *sucken,* black.
Blackbird, *husquinock.*
Blood, *puck-cuchque;* N. J. *mohoock.*
Blue, *puh-squai-loau;* Cree *sipikwaw;* N. Eng. *peshaùi.*
Body, *no-waw-auh;* N. J. *uatuhaape.*
Bone, *whis-scan;* Len. *wochgan;* N. J. *okuaan.*
Bone-house, *man-to-kump* (house to put the bones of the dead into). Probably "sacred place," from Len. *manito,* god, sacred.
A bow, *kullah!ow.*
Boy, *wahocki-a-wauntit;* N. J. *penaetit.*
Brave, *matt-whee-saw-so* (= not cowardly).
Bread, *app!ow;* Len. *n'dapponhe,* I make bread; N. J. *apoon.*
To break, *ne poick-shitt-own;* Len. *poquihillen,* it is broken; N. Eng. *pokeshattouwin.*
Broad, *manckapah-sai-u;* Len. *amangi,* large.
Brother, *ne-ee-mat;* Len. *ni'mat,* my brother.
Bubby, *noo-naque, i.e.,* the mamma; Len. *nunagan* (my.)
Buck, *i-e-ape;* Len. *ajapen.*
Butterfly, *aumaun-co hunt;* N. J. *amookas.*

Cedar, *weensquaaquah.*
Channel, *an-da-timp.*
Chesnut-tree, *eh!-qua-mintz.*
Chin, *unt-tampquet;* Chip. *o'damikan* (his).
Child, *awauntet;* Len. *w'unit* (his).
Cloud, *matchkatquot; ichemackqh* H.; Len. *machtaquoll;* N. J. *kumhaak.*
Cold, *tagh!quiow;* Len. *t'heu;* N. J. *taa.*
Cowardly, *wee saw.so ak* (see "Brave").
Crab, *tah!quah;* Len. *schâhamuis.*
Crane, *ah!secque.*
Creek, *pamptuckquaskque* (see "River").
Crow, *kuh!-hos;* Len. *ahas.*
Cry, to, *num-moam;* Len. *ganschalamuim.*

Dance, to, *zdocumb.*
Day, a, *nucotucquon; kisucku* H.; Len. *gischgu.*

Day-break, *wawpaney; keesequo,* H.; Len. *gisch-apan.*
Darkness, *samp-oo-somow* (radical, *pōs;* = Len. *pis-geu,* it is dark).
Daughter, *hun tawn;* Len. *w'tàn* (his); N. J. *daan-us.*

Dead, place for the, *mutz-uck-zumpq* (the place where the dead are deposited).
Death, *ungue-lack;* H. *eweeshawaak angel;* Len. *ehángelūkgīk,* they are dead; N. J. *nongiil.*
Deep, *timmoh;* Chip. *dimi.*
Deer, *attque, youcat* (four legs); Len. *achtú;* N. J. *aatu.*
Devil, *matt-ann-tote;* Len. *machtando.*
Dew, *quesuppost;* N. J. *sussuuskui.*
Distance, *wah!sow et.*
Doe, *noose-at-q;* Len. *nunsch-etto.*
Dog, *al!um,* H.; Len. *allum.*
Dogwood, *ah!laawhunniminte;* Len. *hattawano minschi.*
Dove, *weetah-tomps;* Sh. *po-weatha.*
Drink, to, *minnih;* Len. *mene.*
Dry, *kow-kitt-ow-a.*
Duck, *quah!quamps* (imitative?); N. J. *quing-quinq.*

Eagle, *ah!whap-pawn-top.*
Ear, *nuch-tow-huck* (my); Len. *w'ittuwak* (his); N. J. *nituuk.*
Earth, *ahkee;* Len. *hacki;* N. J. *haakke.*
Eat, to, *meetsee;* Len. *mizu,* he eats; N. J. *miitshe.*
Eel, *pall!in.*
Egg, *waawhq* (with a whiff); Len. *wahhwall,* pl.
Evening, *weaku;* Len. *wulaku.*
Eye, *nucks-skencequah* (my); Len. *w'uschginquall,* his eyes; N. J. *uiiskingul.*

Face, *assung-gui;* Len. *w'uschgink,* his face (comp. "Eye"); N. J. *uiisking.*
Fall, to, *ah-kinnitsish;* Len. *meschiechin.*
Falsehood, *e-kitt-co.*
Far, *wachschuit;* Chip. *wassa.*
Fat, *pim;* Len. *pomi.*
Father, *nowoze* (my); Len. *n'och;* N. J. *nukuaa.*
Fear, *quischa-asch,* H.; Len. *wischasi.*
Finger, *na-mishah!qu-ulgamz.*
Fire, *tunt;* Len. *tindey;* N. J. *taande.*
Fish, *wammass;* Len. *namees.*
Fly, a, *pootzah;* Len. *utsche;* N. J. *sa-kiime.*
Fog, *howewen;* *auwan,* H.; Len. *awan;* N. J. *auan.*
Food, *mettsah* (comp. "Eat, to").
Foolish, *cuip-shee-in quo;* Len. *gubtocha;* N. J. *kipitsheoote.*
Foot, *nist* (my); Len. *uchsit.*
Fox, *waaks;* Len. *woacus.*
Frog, *clacqu-iss;* Cree *ayekis.*
Frost, *togh!poh!* Len. *topan;* N. J. *tuupan;* N. Eng. *taquattin.*

Girl, *pukquah;* Len. *ochquetsch.*
God, *mann!-itt;* Len. *manitto.*
Good, *wee-ee;* *watti-e-u;* Len. *wulit.*
Grass, *mass-que-quise;* Len. *masgik;* N. J. *muskiikul.*
Grave, *wawskowko;* Len. *pokawen,* a hole.
Green, *ah!skaah-tuck-qui-a;* Len. *asken.*
Gum, *pook-sacq-in-ment.*
Guts, *walah-kiss-sisk.*

Hail, *ah!sinlipwo* (*assin,* stone); N. J. *sidoniila.*
Hair, *nee-eesquat;* Cree *w'estakaya.*
Hand, *nut untz;* N. J. *nacking.*
Hard, *mais-kai-u;* Chip. *mashkawissin,* it is hard.
Hare, a, *timihawque.*
Hate, to, *ne man-nin-now.*
Hawk, *mah!squallen.*
Head, *neelahammon;* Len. *w'il,* his head; N. J. *wheel.*

Hear, to, *no-oan-tum;* N. J. *ni-îndam.*
Heart, *wea!scheu,* H. (his); Len. *w'dee.*
Heat, *nip(ow)kiss,* from Alg. *nîbin,* summer.
Hickory-tree, *psee-cun.*
High, *wha-sa-neep-ai-u; schpummend,* H.; Chip. *ischpamagad,* it is high.
Hill, *lemuckquickse;* Len. *welemuckqueck.*
Hot, *app et-taaw!* Cree *abweyaw.*
House, *youck-huck; iahach,* H.; Len. *wik;* Pot. *ye hawkins.*
Husband, *nups-soh!soh!* (my).

I, *nee;* Len. *ni.*
Ice, *hah!laggu-quuiz;* Len. *m'hocquami;* N. J. *hukkooen.*

Joy, *ne-moo ye-ow-wass.*
Jump, to, *ni-s poicksh,* I jump; Len. *ni-poaktsch.*

Kill, to, *nepoickt-tow;* Alg. root, *nipa.*
King, *tall!ak;* N. J. *qualis,* master, from Len. *allokakasin,* to have power over another, from *allowat,* strong.

Large, *mang-ai-u;* Len. *amangi.*
Laugh, to, *wei-aih-e mitt-a-ha;* Len. *wehemoaluk,* he laughs.
Lean, *moosow wak;* Chip. *asowa.*
Leg, *much-cat;* Len. *w'ickaat* (his).
Lie down, to, *cow-si-nee.*
Life, *ne quee quaaawk;* Pot. *kekugh.*
Light, *wassaquitayw;* Len. *wachêjeu.*
Lightning, *ton-que-ah.*
Lip, *nussihecque.*
Lizzard, *oh!-kaush-kiss;* Len. *gegâchxiis.*
Locust-tree, *kla-one-nahq.*
Long, *quah!!nah!!! qut;* Len. *guna, quoanageu.*
Love, to, *n!wummoi; quammosch,* H.; N. Eng. *cowammaunsch,* I love you.
Low, *tah!quah!quah!-su;* Len. *tachpachsu.*

Maize, *cawl-na-woop.*
Man, *wohacki; naap,* H; Len. *lennāpe.*
Maple tree, *waw-see-ke-me;* Len. *schiechikiminshi.*
Marsh, *nah!squuh!* Len. *masgeku-wiwi.*
Mocking-bird, *ahmittonqha.*
Mat, a, *yawskg.*
Meat, *pumantah* (hog's meat).
Milk, *noo-oo-nack.*
Mole, *alvmob-schkim-nitz.*
Month, a, *nuquoluc quaquoa.*
Moon, *atupquonihanque;* Len. *tpocuniwi gischuch* (night sun).
Morning, *weschpa* H.; from Len. *gischgu,* day.
Mother, *nicque;* Chip. *ninge;* N. J. *onna.*
Mountain, *pomat-tinike; pemettenaichk,* H.; from Alg. root *āmat,* to mount up.
Mouth, *huntowey; mettoon,* H.; Len. *w'toon* (his).
Mud, *piss-sucqua;* Len. *assiscu.*
Mulberry-tree, *whie-in-guaque;* Len. *mint quaqui.*
Muskrat, *weak-keh!* Chip. *wachashk.*

Nails (finger), *nuck-can sump;* Len. *nīchgasch.*
Narrow, *tsipais-u.*
Near, *pechtschtschu,* H.; Len. *pechhutschi.*
Neck, *nissi-kip-puchqh!* N. Eng. *sitchipuck.*
New, *whuis-kai-u;* N. J. *uiisksu* (young).

Night, *toopquow; tuppucku;* Len. *tpoku;* N. J. *tipaake.*
No, *mattah!* Len. *matta.*
Nose, *nick-kee-u* (my); Len. *w'ickiwon* (his); N. J. *uikiiko.*

Oak, *wee-seek-e-mintz;* Len. *wisachgak.*
Old, *kutt-a-nai-u;* Cree *ketteyatisu,* he is old.
Opossum, *nah!simini.*
Owl, *quōo-waant;* Chip. *koko.*
Oysters, *kaw-sheh!*
Oyster-shells, *tsee-ko-mack.*

Partridge, *kittycawndipqua.*
Peas, *pee wah!sh-quist.*
Peace, *e-wee-ne-tu;* Chip. *inawendiwin;* N. Eng. *aquène.*
Pheasant, *uh!quas capitz.*
Perch, *kosh-kike nesuc.*
Persimmon-tree, *law wacq* (see "Mints").
Pigeon, *not siminisuk.*
Pine-tree, *quaat;* Len. *cuwe.*
Point of land, *alla-maa-wampk.*
Pole-cat, *tzuckquaakq;* N. J. *skuaak.*
Pond, *nippiss* (*nip,* water).
Poplar-tree, *wee-saa-quack.*
Pretty, *wee-e-eat.*

Queen, *talla!kesk* (see "King").

Raccoon, *anasup;* Len. *espanni;* N. J. *nahanuun.*
Rain, *winicow; sokelan,* H.; Len. *sokelangetsch,* when it rains; N. J. *suuklan.*
Rainbow, *quenuck-quenuck;* N. J. *monukooen.*
Rattlesnake, *eeh!seekq;* Chip. *jishigwe;* N. Eng. *sesek.*
Raven, *uckquak.*
Red, *psquai-u;* N. Eng. *msqùi.*
Red-bird, *pishquiss eeps.*
Religion, *Lapp!-poi o-wees;* probably "a coming together," from Len. *lappi-lenin.*
River, *pamptuckquah';* *peemtuck,* H.; Len. *kikhit-tuck;* Chip. *pīm,* to flow.
Rock, *koshcup;* Chip. *kischcab,* a perpendicular rock.
Run, to, *un-to-mho-waish.*

Salt, *tzee-e-oose;* Len. *sīkey.*
Sand, *loh!-ki;* Len. *lēkau.*
Sea, *mank-nippint; kittahend,* H., N. J. *kihittuun.*
See, to, *naa-m-m;* Len. *nemen;* N. J. *ni-naaman.*
Shark, *witt-ameek;* Len. *ameek,* fish.
Shallow, *tacq-e-timps-oh.*
Shame, *katt-ak-katts.*
Shoes, *meckhisins;* Pot. *mockasins;* C. *maskisins.*
Shore, *saumps-a-mu.*
Sick, *huntoi-miss;* Chip. *nin nanipinio,* I am sick.
Side, *pomeetempquat.*
Sing, to, *nuck-und-oh;* Len. *nachgohomān.*
Sister, older, *nimpz;* Chip. *nimisse.*
Sister, younger, *neighsum;* Chip. *nishime.*
Sit, to, *qui-ah-quup.*
Skin, *nowas-sium.*
Sky, *moosecaquit;* Len. *moschhac;* N. J. *musheek.*
Sleep, to, *n-upp;* Chip. *nipa.*
Small, *lamaisu; namahchtschu,* H.; Chip. *maskig.*
Smell, to, *ne quees-sum-un.*
Smoke, *niponguōt-tai* (I smoke); Chip. *nin pashkinawe.*
Smoke, to smoke a pipe, *p-simoi.*
Snake, *ash-quoke;* Len. *achgook.*
Snakeroot, *pah!scho-hook-quick;* Len. *blĕu-hòtŭk.*
Snakebite, *ah!sckok-kas sipekoke.*

Snow, *qūoono ; gu'no*, H.; Len. *guhn ;* N. J. *uiina.*
Soft, *patt-ah-ki-u ;* Len. *w'tàcku ;* N. J. *taakke.*
Son, *nucks-quah* (my) ; Len. *quis-sall* (his).
Sorry, *dah-qua-a-nee* (I am sorry).
Sour, *tchee-ee-wun ;* Len. *schwon.*
Speak, to, *ne kitt-o-was ;* N. J. *gi-kiitu.*
Spear, *ne poikee-hek* (see "Arrow-head").
Soul, *tsee-e-p ;* Len. *tschipey.*
Spring, the, *see-qui no ;* Len. *siquon ;* N. J. *sick-quim.*
Spring, a, *mōō-nip-pque* (*nip*, water).
Squirrel, *mowck-key ;* N. J. *houneek.*
Squirrel, flying, *ah!sappaneques ;* ground squirrel, *muck quissah.*
Stand, to, *dogh-kinch ;* Len. *pachsucquin.*
Star, *poomolasuque ;* Pot. *pummahump.*
Stone, a, *kawscup* (see "Rock").
Straight, *lemat-tah'-quot.*
Strike, to, *ne pack-come ;* Len. *popachgan-damen*, to strike dead.
Strong, *miss-ki-u ;* Cree *maskawisiu.*
Summer, *mashaquapau-u ; mechschak wapan*, H. (= the great or long light).
Sun, *ah-quak ; aquequaque ; aequechkkq*, H.; Len. *gischuch ;* N. J. *kiisku.*
Sweet, *wee-ing-on ;* Len. *wingan.*
Sweat, *nip-oo-kiss.*

There, *ennuk*, H.
Thick, *kee-puck-an ;* Len. *cubbachcan.*
Thigh, *hunts-sunque.*
Thin, *ah-shee-penz-o ;* Len. *w'schábban.*
This, that, *you-kan-nah ;* Len. *nanni.*
Thou, *kee ;* Len. *ki.*
Thunder, *awah!-shuck ;* Len. *pedhakquon*, it thunders; N. J. *patihaakun.*
Tobacco, *oh'pucque ;* N. Eng. *puck.*
To-day, *ewapawgup.*
Toe, *nicks-see-equanumps* (my) (= my foot, *iks it*).
To-morrow, *allappahwee.*
Tongue, *neeannow-ah!* (my) ; Len. *w'ilano* (his).
Tooth, *neeput-tumps* (my) ; Len. *w'ipit* (his) ; N. J. *uipiitil.*
Tree, *petuicque ; pauk*, H.; Chip. *pak.*
Truth, *ko-o-lam ;* Len. *leke*, true ; *wulam*, true.
Turkey, *pah!quun ;* Len. *bloeu ;* N. J. *tschikuuna.*
Turkey-buzzard, *moh waas.*

Ugly, *matt-it* (= bad).

Valley, *qualliquawkimuck ; pechsechkamikat*, H.; Len. *pachsajeek.*
Vine, a, *mallaw cominamintz.*
Viper, *apo-tass-sees-a.*

Walnut-tree, *ah!sin-ni-mintz* (from *assin*, stone).
Walk, to, *n-gutt-o-was.*
War, *matt-ah-kass-on ;* Len. *machtágeen.*
Warrior, *matt-ah-ki-ween* (see "War").
Water, *nip ;* Len. *m'bi ;* N. J. *bee ;* Alg. *nipi.*
Wet, *kiss-ep pai-u ;* Len. *niskpeu.*
Whistle, to, *ne queezkso-uh-quitt-um ;* Len. *ni quischktoonheen.*
White, *waap-pay-u ;* Len. *woapsu ;* N. J. *opeek.*
Whore, *amattz-e-no.*
Wild-cat, *laa!waa!quepuss ;* N. Eng. *pussow.*

Wild goose, *quà-hāw-quunt.*
Winding, *apaas-suc-tucqut.*
Winter, *pooponu ; iluppoon*, H.; C. *pipon ;* N. Eng. *popon.*
Wife, *nee-eeswah !* (lit. "my woman").
Wise, *wee-sauce.*
Woman, *acquahique ; aquahoag*, H.; Len. *ochqueu.*
Wood, *meeh-shiz ; michsez*, H.; Len. *minschi ;* Pot. *musses.*
Woods, *pamp tuck-koisk ;* Len. *tékene ;* Sh. *teikou.*
Year, a, *nuquolacutquomai* (see "Month").
Yes, *a-a-mch !*
Yesterday, *holacquow.*
Yellow, *wee-sa-way-u ;* Len. *wisa-weu.*
You, *kee* (= thou).
Young, *laimaisu* (see "Small").

1,	*nukquit.*	18,	*ahtz-wah.*
2,	*na-eez.*	19,	*ahtz-passa, conque.*
3,	*nis (whu).*	20,	*nee-es-mittah.*
4,	*yaguh (whu).*	21,	*neequa-nichquit.*
5,	*nup-pai-a.*	30,	*su-pooks-kay.*
6,	*noqŭttah.*	40,	*yow-pookay.*
7,	*my-yay-wah.*	50,	*nuppay-e poosquah.*
8,	*tzah.*	60,	*nequttah-e poosquah.*
9,	*passa-conque.*	70,	*may-ah-wa-e poosquah.*
10,	*millah !*	80,	*tzaw-e poosquah.*
11,	*ah!tzickquit.*	90,	*passaconque-e poosquah.*
12,	*ahtz-naeez.*	100,	*weemba kissana.*
13,	*ahtz-whus.*	200,	*neesa kissana.*
14,	*ahtz-yough.*	300,	*nuisswa kissana.*
15,	*ahtzup-pay-ah.*	400,	*you-wah!kissana.*
16,	*ahtzaquutah.*	500,	*nuppaia tashakissana.*
17,	*ahtz mayaway.*	1000,	*muttah-taska kissana.*

Second Addition to the Knowledge of the Batrachia and Reptilia of Costa Rica.

By E. D. Cope.

(*Read before the American Philosophical Society, November 17, 1893.*)

The present paper is a second supplement to a memoir on the Batrachia and Reptilia of Costa Rica, published by myself, in the *Journal of the Academy of Natural Sciences of Philadelphia*, for 1875, p. 93. The first supplement is a brief one, and was published in the *Proceedings of the American Philosophical Society*, 1879, p. 271. The whole number of species enumerated up to the latter date was one hundred and thirty-three.

The present supplement is based on material which I have received from my friend, Mr. George K. Cherrie, who is an officer of the Museo

Nacional, of San José. This material differs from that described in former papers in the fact that it was mainly obtained on the Pacific slope of the country,* while the latter was collected on the Atlantic slope and on the central plateau. In the enumeration which follows, the localities are mentioned in greater detail. The total number of species sent by Mr. Cherrie is thirty-three, of which sixteen are additions to the fauna of Costa Rica, and nine are new to science. I hope to be able to figure these species at an early day.

BATRACHIA.

URODELA.

HAPTOGLOSSA PRESSICAUDA, gen. et sp. nov.

Char. gen.—Group of Thoriinae, which includes Thorius Cope and Typhlotriton† Stejneger; hence the vertebræ are opisthocœlous and the carpus and tarsus not ossified. Tongue adherent in front and by the middle. Digits not distinct, 4–5.

This genus is of much interest as the first one discovered in Tropical America in which the tongue is not boletoid in form. It seems also that the relation of this form of the western coast to those of the east coast in this group is the same in Costa Rica as that which prevails in North America. It is well known that no species of salamander, with a boletoid tongue, is found on the Pacific coast of North America.

Char. specif.—Form slender, limbs very small. Length of tail equals that of the body without the head. Length of head contained in that of the body to the vent, seven and a half times; the width less than the length. A gular and nineteen costal folds, the latter not very distinct. Fore and hind limbs each equal to three intercostal spaces. Digits indicated by emarginations of the foot border. Vomerine teeth in two moderately arched transverse series, not produced posteriorly on the middle line, hence well separated from the rather wide single patch of parasphenoid teeth. Tongue rather small, oval. Nostril of moderate size, situated well anteriorly. Eye, large. Tail compressed from near base to apex, with a median dorsal, but no ventral groove, and well-marked vertical grooves.

Color, uniform black; under side of head and tail a little paler than other regions.

Measurements.	MM.
Total length	62
Length to posterior angle of mouth	4
Length to fore limb	8
Length to hind limb	28.5
Length to base of tail	31.5
Width of head at angle of mouth	3

This species resembles superficially the three small salamanders of

* The only exceptions are Nos. 338, 339, and 347.

† For the place of this genus, see Cope, *Proceeds. Acad. Phila.*, October, 1893.

Mexico and Central America, the *Thorius pennatulus* Cope, and the two species of Œdipina (Opheobatrachus). Besides the generic characters, it differs from the latter in the shorter and compressed tail, etc. From the former it differs in the larger number of costal folds, smaller nostril, and in coloration, etc. The single specimen was found at Palma, and is No. 293 of the collection.

ŒDIPUS VARIEGATUS Gray. From Buenos Ayres, No. 301.

SALIENTIA.

BUFO MARINUS L. Lagarto, Nos. 342, 345; Buenos Ayres, Nos. 305–312.
BUFO HÆMATITICUS Cope. Buenos Ayres, 310; Rio Grande, 366.
HYLA GABBII Cope. Buenos Ayres, 306, 309; Lagarto, 375.
HYLA NIGRIPES Cope. Buenos Ayres, 311.
LIOHYLA RANOIDES Cope. *Lithodytes ranoides* Cope. *Proceeds. Amer. Philos. Soc.*, 1885, p. 275.

This species differs from the *L. rugulosa* Cope (*Proceeds. Amer. Philos. Soc.*, 1869, p. 160) in its more elongate muzzle and in the smaller and differently shaped tympanic membrane. In the *L. rugulosa* the membranum tympani is round, and is about equal to the eye; while in the *L. ranoides* it is a vertical oval of about half the same diameter. The belly of the *L. ranoides* is free from rugosities.

Three specimens of this species are in the collection, and they are very dissimilar in coloration, and neither of them resembles the type. They may be arranged thus.

I. Light gray; no dorsal stripe or interocular cross-band. No. 333, near Buenos Ayres.
II. Dark brown, a light interorbital crossband, and black W-shaped mark on interscapular region. No dorsal stripe. Type from Nicaragua. No. 14,179, U. S. National Museum.
III. Dark brown, with a pale, narrow dorsal line, and pale interocular cross-band. No. 288, Terraba.
IV. Dark brown above with a broad pale dorsal stripe, as wide as the internareal space. No interocular cross-band. No. 304, Buenos Ayres.

These speçimens agree in having four dark spots on the upper lip, of which the anterior is below the nostril; in the legs being marked with a few dark-brown cross-bands; and in the femur being obscurely marbled behind. The vomerine teeth are close together, entirely within the interior border of the internal nares, and much posterior to the latter. In No. 304 the dorsal integument displays a fold from cranium to sacrum on each side of the wide dorsal stripe; on the external side of each of these anteriorly three short folds extend upwards and backwards from the orbit.

No. 288 is a female, and resembles in color the *Lithodytes melanostictus* Cope (*Journal Phila. Acad.*, 1875, p. 109), which is from alpine

Costa Rica. That species, however, has no digital webs, and the tympanic membrane is only half as large, its transverse diameter being only a quarter of that of the eye fissure. The vomerine teeth also are not so close together. Specimen No. 288 is a female, and is distended with eggs. There are no traces of dermal folds. In No. 333 there are traces of the folds. Dr. Boulenger (*Catal. Batr. Sal. Brit. Mus.*, Ed. ii, p. 201) describes a species of Liohyla under the name of *Hylodes palmatus*, although he places under it as synonymous the older names of *Liyla* (*Liohyla*) *guentherii* Keferstein and *L. rugulosa* Cope. The size of the tympanum, and length of hind limb are indefinitely described, but the back and sides are said to be tubercular, which is not the case in this species. Mr. Boulenger also states, rather indefinitely, that the toes of his *H. palmatus* are "one-third webbed." The palmation in *L. ranoides* extends to the extremity of the metatarsals. This is one-third the length of the first and second digits, but much less than a third the length of the other digits.

The eggs of this species are of extraordinary size, equaling large peas.

LITHODYTES FLORULENTUS, sp. nov.

In introducing a new species of Central American Lithodytes, it is necessary to point out clearly the distinctive features of those already known. I confine my attention at present to the species with plain frontoparietal bones, and therefore omit further reference to the *L. pelviculus*, *L. megacephalus* and *L. gulosus*, where there is a crest along the superolateral angle of the skull. The other species differ as follows:

I. Heel not reaching the muzzle.

Vomerine patches widely separated; digital dilatations large; colors plain.....*L. diastema* Cope.

Vomerine patches close together; digital dilatations small; colors variegated .....*L. florulentus* Cope.

II. Heel of extended leg reaching muzzle or beyond.

a. Tympanic drum equal half to two-thirds diameter of orbit.

Digital dilatations small, especially on hand.....*L. rhodopis* Cope.

a. Tympanic drum small, one-fourth diameter of orbit.

Digital dilatations large, especially on hand.....*L. melanostictus* Cope.

The only specimen of the *L. florulentus* is damaged as to the integument of its head, which has been destroyed by agencies unknown to me. The skull with its muscles, and the rest of the body with the integument, are preserved. The head is short and depressed, and the canthus rostralis is not distinct. The length of the muzzle from the nostril to the orbit is about equal to the anteroposterior diameter of the latter, and the nostril is quite near the end of the nose. The tongue is subround, and is a little wider than long in its present condition. The internal nares are well forwards; and the vomerine teeth are in two fascicles which are close together, and are so far posterior to the nares as to be in transverse line with the pala-

tine ridges. They are also as far as their own diameter within the anteroposterior line of the internal nares. The ostia pharyngea are narrow slits about as long as the nares. The tympanic drum is destroyed, but the space for it is a vertical oval, with about half the anteroposterior diameter of the orbit. The heel of the extended hind limb reaches the anterior border of the orbit. The extremital dilatations are very small. There is a rather large oval internal or prehallucal tubercle which is entirely sessile; there is a small external tubercle. There are two palmar tubercles, and those of the anterior digits are distinct but flat; those of the posterior digits are less distinct. The integuments of the inferior and concealed surfaces are smooth; on that of the back a few small tubercles are present.

The color of the upper surfaces is gray dusted with blackish. The inferior or posterior surface of the hind legs is black, and this color is continuous with dark-gray cross-bands which cross the superior faces of the tibia and femur, four over each. The spaces between these cross-bands are scarlet. The posterior part of the sides and anterior part of the abdomen is blackish to brownish, with crimson and orange spots of various sizes and shapes, the largest in the groin. Three cross-bands on upper side of foot, and three across forearm. Coloration of head unknown.

Measurements.

	MM.
Total length of head and body	35
Length of head to posterior line of tympanum	12.5
Width of head at posterior line of tympanum	15
Interorbital width	3.5
Length of fore limb	20
Length of fore foot	9
Length of hind limb from groin	51
Length of hind foot	24
Length of tarsus	9

The only specimen of this handsome species contained in the collection is from Boruca, and is No. 327.

LITHODYTES RHODOPIS Cope, *Proceeds. Acad. Phila.*, 1866, p. 323; *Proceeds. Amer. Philos. Soc.*, 1869, p. 160. *Hylodes sallæi* Günther, *Proceeds. Zoöl. Soc.*, London, 1868, 487, Pl. 38, Fig. 3. *Lithodytes podiciferus* Cope, *Journal Acad. Phila.*, 1875, p. 107, Pl. 23, Fig. 9. *L. habenatus* Cope, *l. c.*, p. 109. *L. muricinus* Cope, *l. c.*, p. 108, Pl. 23, Fig. 13.

After full comparison of the material at my disposal, I strongly suspect that all the forms described above as distinct species are simply varieties of a single variable one. In some young individuals the vomerine series of teeth appear more transverse, as in the individual called muricinus. In such small individuals, the pigment is apt to be brilliant. In

the present collection a small specimen of only 13 mm. in length has the entire superior surfaces of a bright violet, as in the specimen called muricinus; but it presents no structural difference from the form habenatus, and small examples of the form podiciferus. From Buenos Ayres; No. 331.

HYLODES STEJNEGERIANUS, sp. nov.

Muzzle flat, canthus rostralis distinct, concave, extremely little prominent. Nostril near the extremity and as far anterior to the eye as the long diameter of the eye slit. This latter dimension equals the diameter of the nearly round tympanic membrane. Integument of head smooth; that of back with a delicate median fold, and a fold on each side which diverges at the scapular region and extends to the orbit. Parallel to the laterodorsal fold is a dorsolateral fold on each side which terminates anteriorly near to the oblique fold just mentioned. Between these folds the integument is tubercular. Sides and belly roughened with small tubercles; breast and throat smooth. Tongue longer than wide, pyriform, scarcely notched. Vomerine teeth in two fascicles well behind the choanæ, and farther apart than each one is within the longitudinal line of the internal border of the nares. The heel of the extended hind limb reaches the anterior border of the orbit. Width of head 2 3 times in length of head and body. Digital enlargements small.

Color above a dark bistre brown, with a pink band extending on each side from the eye to the sacrum, passing above the tympanic membrane. Posterior limbs blackish brown, except the inferior side of the femora, which are a lighter brown. Fore limbs pink with brown cross-bands. Belly dirty white, the breast and throat densely dusted with brown. Head uniform blackish brown, with the exception that on the edge of the upper lip there are three pairs of pale vertical bars which represent the borders of three lip-spots.

Measurements.

	MM.
Length of head and body	15
Length of head to posterior border of tympana	5.5
Width of head at posterior border of tympana	5.5
Length of fore limb	11
Length of fore foot	2.5
Length of hind limb	24.5
Length of hind foot	11
Length of tarsus	4.5

It is only necessary to compare this species with the *H. polyptychus* Cope (*Proceeds. Amer. Philos. Soc.*, 1885, p. 276) from Nicaragua. In this species the top of the head and especially the eyelids are tubercular, while they are smooth in the *H. stejnegerianus*, and the integument generally is covered with larger and more numerous warts. The muzzle is shorter

and wider, and the tympanic disc is only two-thirds the eye diameter. Finally, the series of vomerine teeth are more transversely extended.

This species is dedicated to Dr. Leonard Stejneger, the distinguished zoölogist now in charge of the herpetological department of the U. S. National Museum, Washington. It is from Palmar; coll. No. 295.

LEPTODACTYLUS QUADRIVITTATUS, sp. nov.

Form lanceolate; muzzle narrow and prominent, nostril a little nearer the orbit than the extremity of the muzzle, but further from the orbit than the diameter of the latter. Extended hind limb reaching the anterior orbital border with the heel. Interorbital space wider than eyelid. Skin smooth except some warts about the scapular region. Two stout glandular ridges on each side of the vertebral median line. A discoidal abdominal fold. Subdigital tubercles well developed; ungual phalanges not dilated. A distinct oval internal metatarsal tubercle.

The vomerine teeth are in two arched series which extend outwards to the line of the external border of the choanæ, and approach close together on the median line. The choanæ are large and about equal the ostia pharyngea. Tympanic disc a horizontal oval, its long diameter equal two-thirds that of the eye. Tongue a wide longitudinal oval, openly notched behind.

The ground color above and on the sides is gray, which is marked above with four longitudinal black bands. The two median of these are wider and commence at the end of the muzzle, and extend to the extremity of the urostyle. They expand above and over the eyelids. The lateral bands commence narrow at the orbits, and widen on the sides, extending to the groin. The median dorsal band of the ground color is paler than the rest of the ground, and has a pinkish tinge, which is probably more distinct in life, judging from traces of pink near the orbit. The side of the head is black to and including the tympanic disc; excepting a pale stripe which passes below the eye to the lower border of the tympanic disc. It is crossed by two or three black lines which descend from the eye to the black lip. A pale crescent in front of tympanic disc. A pale line extends upwards and forwards from the groin on the side. The limbs are all cross-banded, except the tibia, whose upper surface displays an irregular, wide, longitudinal band, which is a marked peculiarity. Posterior face of femur bounded below by a pale line, which is bordered above by a brown band. Tibia uncolored, foot brown, below.

Measurements.

	MM.
Length of head and body	37
Length of head to line of posterior edge of tympana	14
Width of head at line of posterior edge of tympana	15
Length of anterior limb from axilla	18
Length of anterior foot	8

Measurements.	MM.
Length of posterior limb	65
Length of posterior foot	31
Length of tarsus	12

From Buenos Ayres; No. 365.

This species is allied to the *L. labialis* Cope and the *L. longirostris* Blgr.; the former Mexican, the latter Brazilian. In the latter the dentition and form of head are similar; but the front is narrower than the eyelid, the hind legs are longer (the heel reaching the end of the muzzle), and there are but two dorsal glandular folds. The length of the limbs is as in *L. labialis*, but the series of vomerine teeth are further extended outwards, the muzzle is longer; and the glandular tubercles of the groin of the *L. labialis* are wanting. The original description of the latter species was taken from young individuals, and includes the statement that the species has no discoidal abdominal fold. This is a mistake; the fold is present.

ATELOPUS VARIUS Stannius.

Nos. 296–298, Palmar.

DENDROBATES TINCTORIUS Wagl., subsp. AURATUS Gird.

Nos. 290, 369, 370, 371, from Palmar. No. 339 from Talamanca is similar, but the pale cross-bands both above and below are much wider, much reducing the area of the black ground color.

Subspecies VITTATUS, nova. In this color form the ground is black everywhere, and the only marks are a pale stripe on each side, which passes from above the groin above the extremities of the diapophyses of the vertebræ, on the upper eyelids, and joins its mate on the end of the muzzle. This form has the lateral stripes of the *D. talamancæ*, but resembles it in no other respect. The second finger equals or is longer than the first. In *D. talamancæ* it is shorter. Nos. 367, 368, from Buenos Ayres.

REPTILIA.

LACERTILIA.

MOCOA CHERRIEI, sp. nov.

This species resembles the *M. assata*, but differs conspicuously in these respects: First, the limbs are relatively considerably more elongate, for when appressed to the side they overlap by the length of the anterior foot. In the *M. assata* they fail to meet by the length of the fore leg. Second, the scales are more numerous, being in thirty-four rows; and those on the sides are smaller than those on the back and belly. In *M. assata* the number of rows does not exceed thirty, and the scales are of equal sizes. Thirdly, the coloration is different. The ground is blackish olive, and there is a black dorsolateral band which has a not very distinct pale dorsal border. A faint pale median dorsal band is bordered on each side by a narrow black line. There are small pale dots on various scales, which

are especially conspicuous on the sides of the body and tail. On the latter they are arranged in transverse rows. Fore legs blackish with pale variegations; hind legs blackish. The black lateral band extends to the end of the muzzle, and a less regular one extends from the orbit to the humerus. Head above pale brown. Fourth, the tail is compressed; in *M. assata* the section is round.

Measurements.

	MM.
Total length	56
Length of head and body	23.5
Length to axilla	11
Length of fore limb	7
Length of hind limb	10

Palmar; No. 292. This species, the second one of the genus found in America, is dedicated to Mr. George K. Cherrie, the well-known zoölogist of San José, who has added much to our knowledge of the life of Costa Rica.

GYMNOPHTHALMUS LÆVICAUDUS Cope. *Tretioscincus lævicaudus* Cope. *Epaphelus sumichrastii* Cope. *Gymnopthalmus sumichrastii* Boulenger.

No. 287, Terraba.

AMIVA QUADRILINEATA Hallow. (*Cnemidophorus*). *A. gabbiana* Cope, *Journ. Acad. Phila.*, 1875, p. 117, Pl. 28, Fig. 3.

Why Boulenger regards this lizard as identical with the *A. undulata* is difficult to understand. The differences are numerous, that in the form and size of the gular scales being especially marked. The species was characterized by Hallowell from small individuals; the present collection contains one (No. 379) which measures (with tail) 205 mm., which equals the types of *A. gabbiana*.

Nos. 303, 313, 322–324, Buenos Ayres; 373, Lagarto; 379, Boca Sacate.

I have before me fifteen specimens of *A. undulata*, and find that ten of these have three supraorbital plates and four have four. In none of them are the gular scales so small as in the *A. quadrilineata*. The specimens are from various localities between middle Vera Cruz and Guatemala inclusive.

AMIVA FESTIVA Licht.

Boruca, No. 325; one specimen.

AMIVA LEPTOPHRYS, sp. nov.

Abdominal plates in eight rows, those of the external row as large as those of the next row. Keels of caudal scales forming straight lines. Gular scales larger in several longitudinal rows, the two median especially

enlarged. One row of seven very large scales on the mesoptychium. Anal scuta consisting of two large medians surrounded by numerous smaller scales, separated by several rows from the vent. Femora with only three rows over the distal fourth of the length; within this point small rows separate the plates from the femoral pores; the latter twenty-four in number. Tibial plates in three rows, those of the internal very small; no heel spurs. The heel of the extended hind limb reaches the elbow. Five large labials to below the orbit. One postnasal and one large loreal longer than high. Two preoculars, wide and keeled at their middle. A preoculo-loreal resting on the labials. Six inferior labials and six infralabials, the last small. Three supraorbitals; first and second longer than wide, the third long as wide. Two parietals on each side; the interparietal separated from them and the frontoparietals by small scales.

Color brown above and olivaceous below. On the line where the back passes into the side, a series of dark-brown spots situated close together, and presenting angles upwards and downwards. There are about a dozen between the groin and the scapular region, and a series of indistinct pale spots is seen between their inferior apices. From their superior apices, narrow and indistinct dark-brown lines cross the back, sometimes alternating with each other on the median line.

Measurements.

	MM.
Length to extremity of tail	327
Length to vent	102
Length to axilla	37
Length to posterior border of ear (axial)	25
Length of fore leg	42
Length of fore foot	19
Length of hind leg	88
Length of hind foot	47

From Buenos Ayres, No. 318; one specimen.

This species is allied to both the *A. festiva* and *A. undulata*, but differs from both materially in the scutellation of the head. The middle and posterior supraorbital plates are broader than long in these species, and the superior preocular is narrower, and is keeled near to its anterior border in whole or in part. The interparietal plate is in contact with the surrounding scuta, and not, as in *A. leptophrys*, surrounded by small scales.

CELESTUS STEINDACHNERII Cope.

From Boruca; No. 300; one specimen. This individual has thirty-six longitudinal series of scales, which have nine longitudinal keels on the middle and posterior parts of the body and on the tail, and are without prominent median keel. Anterior scales smooth. Two prefrontals. This specimen presents characters of both the *C. steindachnerii* and the *chaly-*

bæus Cope, and in some respects differs from both. Whether there is one variable species or not, more abundant material is necessary to decide.

CTENOSAURA, sp. young, Nos. 376, 377.

IGUANA TUBERCULATA, L., No. 378.

ANOLIS LONGIPES, sp. nov.

Size of *A. biporcatus*; head short, wide; limbs long, the posterior when extended reaching the end of the nose. Tail cylindric, covered with scales of equal size, which are freely keeled above and below. Tibia equal length of head to auricular meatus, and longer than length to occiput. Scales of body of medium size, subequal, those of belly imbricate and keeled; those of back not imbricate and smooth. Occipital plate rather smaller than the large auricular meatus, and separated by two rows of scales from supraorbital rows. The latter are separated from each other by two rows of scales. Frontal ridges well defined, and separated from each other by five and six rows. Five loreal rows and six supraorbital rows, the latter diminishing in size gradually outwards. Scales of limbs keeled. Scales of top of head, including supraorbitals, with a single keel. Tail elongate.

Color brown above, dirty white below. A dark-brown band originates on each side of the occiput, and extends continuously on the basal part of the tail. On the body a delicate brown line extends above and parallel to it. A dark-brown cross-band between orbits, and a dark-brown chevron with the angle pointing backwards on the prefrontal concavity. Four broad dark cross-bands across lips; limbs indistinctly cross-banded.

Measurements.	MM.
Total length	245
Length to vent	83
Length to axilla	40
Length to auricular meatus posteriorly	23
Width at auricular meatus posteriorly	16
Length of fore limb	39
Length of fore foot	17
Length of hind limb (to acetabulum)	80
Length of hind foot	34

Palmar, No. 343, adult; No. 299, Boruca, young.

The small size of the fan in No. 343 indicates that it is a female; it is much better developed in the young, No. 299, which is quite small. In the young, the scales of the head are not keeled, and the keels of the abdominal scales are less distinct. The color is a bright yellow, with a broad brown band surrounding the head above and below at the orbit, and another capping the nose and chin, the loreal region remaining yellow. The yellow cross-band on the chin which separates these two areas leaves a visible trace on the adult.

This species is allied to the *A. bransfordii* Cope, which has been found so far in Nicaragua only. The *A. bransfordii* was described from a specimen about half the size of the type of *A. longipes*, but of very similar proportions. In various details of structure they are similar, but in the *A. bransfordii* the scales of the head and belly are smooth, and the latter are longer than the dorsal scales. The latter are quite small, which cannot be said of those of the *A. longipes*. Finally the coloration is very different. The affinities of *A. longipes* to *A. capito* Pet. are not distant. In the latter species the head is still shorter and wider, and it is covered above and on the sides with larger and fewer scales, which are without keels.

ANOLIS INTERMEDIUS Peters.

San José, No. 338.

ANOLIS TROCHILUS Cope.

Palmar, 319; Sierpe, 383, 384; loc? 291. No. 384 is a male with very large fan. There is a trace of carination on the median dorsal scales, and the tail is compressed, and the median superior row of scales form a rather prominent serrate outline.

BASILISCUS VITTATUS Wiegm. From Sierpe.

OPHIDIA.

COLOBOGNATHUS HOFFMANNII Peters.

San José, No. 347.

RHADINÆA IGNITA Cope.

Boruca, No. 348. This specimen differs from the type in having only one preocular plate, and in having the angle of the third superior labial plate enter the orbit. The first-mentioned character was variable in the specimens which served as types. In coloration the dots on the gastrosteges are confined to the anterior sixth of the body, and the belly is yellow and not red. There are 117 gastrosteges, while in the type there are 128. Bocourt has shown the great variability in the number of gastrosteges in this genus. I suspect, however, that the specimen sent by Mr. Cherrie represents a local race.

DRYMOBIUS RHOMBIFER Peters.

Palmar, No. 382.

DRYMOBIUS CŒRULEUS Fisch.

Boruca, No. 381.

DRYMOBIUS PERCARINATUS, sp. nov.

Scales lanciform, in seventeen longitudinal rows, all keeled except the first, the second feebly. Head elongate; eyes large, their horizontal diameter equal the space from their anterior border to the posterior border

of the rostral plate. Rostral plate a little visible from above; internasals subquadrate; frontal about as wide at middle as each superciliary, and a little shorter than the parietals. Loreal longer than high; one preocular, which does not reach the frontal. Two postoculars, the superior the longer, and half bounded posteriorly by the parietal. Temporals, 2–2, the anterior elongate. Superior labials nine, fourth, fifth and sixth in orbit; all longer than high, except the second, which is quadrate, and the seventh, which is subtriangular. The eighth is much the longest. Inferior labials ten; genials long, the posterior the longer. Gastrosteges 155; anal 1–1; urosteges 145.

Color above, brown; below, cream color. Small rusty spots appear on the sides throughout the length, at intervals of two scales, on the fourth or fourth and fifth rows; and they are bounded posteriorly by a small deep brown spot. From the middle of the body posteriorly, the first three rows of scales are paler than those above them, and the third row carries a small black spot on each scale. These spots become confluent into a narrow stripe, which is distinct on the posterior fourth of the body and on the side of the tail. The scales of one and two rows above this stripe are paler than those of the median dorsal region. Head uniform brown; upper lip and below uniform yellowish.

Total length 815 mm.; total length of tail 352 mm.; length of head to canthus oris, 20 mm.; interorbital width 8 mm.

Boruca, No. 326, adult; Buenos Ayres, No. 336, young. In the young, the anterior half of the body presents the cross-bars characteristic of the young of this genus. On the posterior half the cross-bars are broken up into a series of small dark spots on each side, and a narrow longitudinal lateral stripe below them, as has been already shown to exist in the adult.

SYNCHALINUS CORALLIOIDES, gen. et sp. nov.

Char. gen.—Teeth equal, smooth. Scales with two terminal fossæ. Body compressed, gastrosteges sharply angulated near extremities; head distinct. Pupil round. Anal plate entire; subcaudals in two rows. Cephalic plates normal except that the nasals and loreal are fused into a single, elongate plate.

In this genus we have apparently a colubrine snake of arboreal habits, which has assumed a boæform character rather than that characteristic of the tree-snakes proper. In the thin scales and fusion of lateral head plates we have a resemblance to the little known genus, Amastridium, but that form is of entirely terrestrial habit.

Char. specif.—This snake has at first sight considerable resemblance to some of the color varieties of the tree-boa, *Corallus hortulanus*. In its color tints and patterns it also resembles the *Spilotes lunulatus* m. The body and tail assume a coiled attitude in spirits like the species of Corallus, and the sharp angles of the gastrosteges show that the habits are similar.

Scales in twenty-three rows, the first and several median composed of

the largest scales. Three or four median rows faintly keeled on the posterior three-fourths the length of the body. Muzzle subtruncate; eye large, its horizontal diameter equal the distance from its anterior border to the posterior border of the rostral plate. Rostral plate slightly visible from above; internasals subquadrate; prefrontals wider than long. Frontal shorter than superciliaries, with concave lateral borders; as wide at the middle as a superciliary. Parietals as wide as long, and regularly rounded in posterior outline. Nasal part of the nasoloreal plate with the superior and inferior borders parallel; the superior border posterior to the nasal part, sloping downwards to a subacute angle with the inferior border, which is in contact with the wide preocular. The latter barely reaches the frontal on one side, and fails to do so on the other. Postoculars two, the superior larger and half bounded posteriorly by the parietal. Temporals 2–2; the interior anterior temporal in contact behind with the parietal. Superior labials eight, the last very long on both sides, and probably consisting of two plates fused. Fourth, fifth and sixth plates bounding orbit, the seventh a horizontally placed parallelogram. Inferior labials 12–13, much divided anteriorly, the posterior six all longer than deep. Genials elongate, the posterior pair longer. Gastrosteges 209; anal 1; urosteges 134. Total length 450 mm.; length of tail 125 mm.; length of head to rictus oris 20 mm.

The ground color of the upper surfaces of this snake is a rich yellowish brown. On the narrow dorsal region is a median series of parallelogrammic spots of an iron-rust color, each of which has a small blackish spot at its anterior extremity. On the sides are wide vertical spots of iron-rust color, which are of equal width with the length of the dorsal spots, and which sometimes coincide with the latter, forming with them broad cross-bands. The chin and throat are cream-colored, but this color becomes clouded, first with light, then with darker brown, and then with rusty red with blackish specks, till the middle line of the abdomen posteriorly is a dark mahogany. Opposite each vertical lateral bar is a dark spot on the upturned extremity of the gastrostege. These become darker posteriorly, forming subquadrate mahogany spots. Immediately below them a wide pale border further varies the colors of the abdomen. A dark-brown band passes to the neck posterior to the eye, and three descend from the eye across the upper lip. Top of head rich yellowish brown, with a mahogany spot on the posterior part of the prefrontal common suture, the posterior part of the frontal, on the middle of each parietal, and on the posterior external border of each parietal. Loreal region mahogany. Black spots on the anterior and middle inferior labial plates.

Buenos Ayres, one specimen, No. 340. This is a handsome species, whose colors are well calculated to conceal it on tree trunks and branches where rusty colors predominate. In general character they are a good deal like those of the *Amastridium veliferum* of Veragua.

SIBON SEPTENTRIONALE Kenn., subsp. RUBRICATUM.

No. 346, from Boca Mala, represents a form of this species to which subspecific rank may be at least accorded. If additional specimens confirm the characters it may even rank as a species. A decision cannot now be reached, as only a single specimen has been sent by Mr. Cherrie.

In this form the body is robust, and the head is not separated by a narrow neck, although the temporal region is somewhat swollen. The muzzle is short, and there are eight superior labials, of which the fourth and fifth enter the orbit. Oculars, 2–2, the lower preocular, labial. Twenty-three rows of scales. Five undivided scuta posterior to the vent. The color of the dorsal regions is bright red; of the inferior regions, light salmon color dusted with brown. There are sixty-one transversely oval black spots on the back, which cover twelve rows of scales transversely, and two and a half to three and a half rows longitudinally. Small black spots alternate with them on the third row of scales; and a less definite row of smaller spots alternate with these on the second and third rows. A black band extends from the eye to the last labial plate, and behind and above it a parallel black band extends from the parietal plate. The extremities of these bands are fused with the first dorsal spot, the interspaces being red. Superior labials red, with a black spot in the centre of each plate. Inferior labials black spotted. Top of head dark brown, bordered posteriorly on outline of parietal plates by a red crescent. This is bordered posteriorly by a black crescent, and is traversed by a median black stripe which connects the dark brown of the vertex with the anterior four black dorsal spots Tail blackish red, spotted above. Total length, 660 mm.; of tail, 133 mm.

I have seen the Mexican *Sibon septentrionale* living, and the ground color is light brown, and not red. The color pattern of the form *rubricatum* is peculiar about the head, but in other respects it resembles individuals of the *S. septentrionale* which have numerous dorsal spots.

OXYBELIS ACUMINATA Wied.

Terraba, No. 289; No. 385 without locality.

ELAPS NIGROCINCTUS Girard.

Buenos Ayres, No. 341; Boruca, No. 329.

Summary.

	No. of Species.	New Species.
Urodela	2	1
Salientia	10	3
Lacertilia	12	3
Ophidia	9	2
Totals	33	9

Stated Meeting, November 3, 1893.

Secretary, Dr. DANIEL G. BRINTON, in the Chair.

Correspondence was submitted as follows:

Letters of acceptance of membership were received from (2221) Dr. Samuel A. Green, Boston, Mass.; (2222) Dr. John G. Morris, Baltimore, Md.; (2224) Prof. J. M. Hoppin, New Haven, Conn.

A letter of resignation was received from Hon. Joseph Allison, Philadelphia, and on motion the resignation was accepted.

The following were placed on the Proceedings exchange list: Société Scientifique du Chili, Santiago de Chili; Oberlin College Library, Oberlin, Ohio; Texas Academy of Science, Austin, Texas; Enoch Pratt Free Library, Baltimore, Md.; Institute of Jamaica, Kingston, Jamaica; Journal of the U. S. Artillery, Fortress Monroe, Va.; Rassegna delle Scienze Geologiche, Rome, Italy; Royal Microscopical Society, London, England; University of the State of Missouri, Columbia, Mo.; Observatorio Meteorologico-Magnetico Central, Mexico, Mex.; State Historical Society, Lincoln, Neb.; Faculté des Sciences, Marseilles, France; Société Physico-Mathématique, Kasau, Russia; Society of Bohemian Students, Prague, "Slavia," Bohemia; University Quarterly, Lawrence, Kans.; California State Mining Bureau, San Francisco, Cal.

Accessions to the Library were reported from the K. Svenska Vetenskaps Akademie, Stockholm, Sweden; R. Académie des Sciences, Amsterdam, Netherlands; K. Bibliothuk, 'S Gravenhage, The Hague; Académie Royale de Belgique, Bruxelles; Magyar Tudomanyos Akadémiai, Budapest, Hungary; Senckenbergische Naturforschende Gesellschaft, Frankfurt a. Main, Germany; R. Accademie dei Lincei, Institut International de Statistique, Rome, Italy; Canadian Institute, Toronto; Yale University, New Haven, Conn.; Geolog-

ical Society of America, Rochester, N. Y.; Indian Rights' Association, Messrs. MacCalla & Co., Philadelphia; Department of State, Bureau of Education, Washington, D. C.; Dr. John Mallett, University of Virginia; Agricultural Experiment Stations, Orono, Me., Providence, R. I., Raleigh, N. C.; Board of Education of School District No. 1, Denver, Colo.; Sociedad Mexicana de Historia Natural, Messrs. José G. Aguilera y Ezequiel Ordonez, Mexico, Mexico.

The following deaths were announced: Dr. C. Leemans, Leiden, October 14, 1893, æt. 84; Furman Sheppard, Philadelphia, November 3, 1893 (b. November 21, 1823).

On motion, the President was authorized to appoint a suitable person to prepare the usual obituary notice of the latter.

Prof L. M. Haupt made some remarks on the proposed Atlantic Coast Ship Canal. He advocated the canal which is to connect the waters of the Delaware river with those of New York harbor. Such a canal, he said, would reduce the distance by water to the coal fields from New York city. As there are over 6,000,000 tons of coal consumed annually in New York alone, the saving in this item would be not less than $3,000,000, which is the interest of $50,000,000, or about four times the estimated cost of the work. The canal would appear to be needed by the ports of both New York and Philadelphia. The commerce of Philadelphia especially would be greatly stimulated by such a water-way. Cheap transportation was the basis of his remarks. What was advocated is the construction of a deep draught canal. It would be quite as practicable to ship freight by this canal as it is by railways, and quite as economical and rapid.

Prof. Haupt then detailed the operations of the great canals of the world. Leaving the Suez and Nicaragua canals out of the question, he said no canal accomplishes such a great saving as this one would.

A resolution read in the Senate by Senator Higgins was then quoted by Prof. Haupt, asking that the Secretary of War be "authorized and directed to cause a survey and examination to be made, at the earliest practicable time, for the lo-

cation of a ship canal from Philadelphia across New Jersey to New York Bay."

With these water-ways open, it would be of great advantage to the United States in war time. Except in an exceedingly severe winter the canal could be kept open by running ice-boats.

The following resolution, offered by Dr. J. Cheston Morris, was unanimously adopted:

That Prof. Haupt's proposition for a ship canal between New York and Chesapeake Bay be referred to Council for consideration and recommendation of such action, if any, as it may deem advisable for the Society.

Dr. Brinton made some remarks upon a Nanticoke Indian Vocabulary compiled for President Jefferson in 1792, in the possession of the Society, dilating upon its value as the only surviving relic of that language. On motion of Mr. Smyth, Dr. Brinton was requested to edit and prepare the same for publication in the Society's Proceedings.

Prof. Cope presented a paper for the Proceedings on a new genus Tomiopsis.

Mr. Prime called attention to a new gold field in Western Australia. About 350 miles east of Perth, the chief city of the Colony, slate occurs broken through by dykes of diorite. The country is very arid, so much so that water has to be transported for watering stock and is sold at fifteen cents per gallon. The gold deposit has been opened to but a slight depth. At the outcrop the bonanza is but two feet wide and about ten feet long; at a depth of about twelve feet it widens to four feet, while the length is doubled. Several tons of ore have been taken out, which carry 2000 ounces of gold to the ton, which is probably the richest ore hitherto found. The gold occurs very coarsely distributed in quartz. The gold is separated by screening and then blowing the gangue away by air-blast. Owing to the richness of the ore, the owners work the mine themselves, being afraid to trust hired miners.

And the Society was adjourned by the presiding member.

Stated Meeting, November 17, 1893.

President, Mr. FRALEY, in the Chair.

A circular was received from the Wyoming Historical and Geological Society, Wilkesbarre, Pa., inviting the Society to be present at the opening of its new building, Nov. 20, 1893.

Letters of envoy were received from the Geological Survey of India, Calcutta; K. Svenska Vetenskaps Akademien, Stockholm, Sweden; Royal Academy of Sciences, Amsterdam, Netherlands; Ministero della Instruzione Publica, Rome, Italy; Schlesische Gesellschaft für Vaterländische Cultur, Breslau, Prussia; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Central Bureau der Internationalen Erdmessung, Potsdam, Prussia; Geological Society of America, Rochester, N. Y.; Bureau of Education, Washington, D. C.; Kansas University, Lawrence, Kans.

Letters of acknowledgment were received from the Public Library, Wellington, N. Z. (140); China Branch of the Royal Asiatic Society, Shanghai (139, 140); Imperial Academy of Science (141), Observatoire Physique Central (141), Prof. Sergé Nikitin (139–141), St. Petersburg, Russia; Prof. Japetus J. Steenstrup, Copenhagen, Denmark (141); Académie Royale des Sciences, Amsterdam, Netherlands (137–140, and Trans., xvii, 1, 2); K. K. Astronomisch-meteorologische Observatorium, Triest, Austria (139, 140); K. K. Geologische Reichsanstalt (140), Dr. Aristides Brezina, Prof. Dr. Friedrich Müller, Vienna, Austria (141); K. Geodätisches Institut, Potsdam, Prussia (140, 141); Redaction der *Naturwissenschaftlichen Wochenschrift*, Berlin, Prussia (139); University of Bonn (140); Naturforschende Gesellschaft, Emden, Prussia (139, 140); Geographische Gesellschaft, Hamburg, Germany (140, 141); M. Otto Böhtlingk, Leipzig, Saxony (141); Verein der Freunde der Naturgeschichte, Mecklenburg, Germany (140); Prof. Guido Cora, Turin, Italy (140); Académie des Sciences et Belles-Lettres, Angers, France (140); Société d'Histoire et d'Archéologie, Chalon s. Saone, France (141); Université de

Lyon, Lyon, France (141); Redaction de Cosmos, Cmte. de Charencey, M. Victor Duruy, Profs. E. Mascart, Gaston Maspero, Marquis de Nadaillac, Paris, France (141); Society of Antiquaries, London, England (141, and Trans., xvii, 3, xviii, 1, 2); Royal Geological Society of Ireland, Dublin (141, and Trans., xvii, 3, xviii, 1); Prof. James Geikie, Edinburgh, Scotland (141); American Antiquarian Society, Worcester, Mass. (141); University of the State of New York, Albany (141); Prof. W. L. Hewett, Ithaca, N. Y. (137–141); Bureau of Ethnology (139), Prof. C. V. Riley, Washington, D. C. (141); Nebraska State Historical Society, Lincoln (140, 141); California Academy of Sciences, San Francisco (137–139, 141).

Accessions to the Library were reported from Prof. O. A. L. Pihl, Christiana, Norway; Association Géodésique Internationale, Bruxelles, Belgium; K. K. Central Anstalt für Meteorologie und Erdmagnetismus, Vienna, Austria; Schlesische Gesellschaft für Vaterländische Cultur, Breslau, Prussia; Verein für Geographie u. Statistik, Frankfurt a. M. Germany; Naturhistorische Gesellschaft, Nürnberg, Bavaria; Nassauische Verein für Naturkunde, Prof. F. v. Sandberger, Wiesbaden, Prussia; Ministero della Instruzione Publica, Rome, Italy; Société Autopsie, Société N. d'Acclimation, Paris, France; Islenzka Fornleifafélag, Reykjavik, Iceland; Peabody Education Fund, Cambridge, Mass.; Prof. John Henry Comstock, Ithaca, N. Y.; Dr. Charles A. Oliver, Messrs. Henry Phillips, Jr., Frederick Prime, Philadelphia; California State Mining Bureau, Sacramento, Cal.; Kansas University, Lawrence.

Photographs for the Society's album were received of Hon. Frederick Fraley, Drs. D. G. Brinton, J. C. Morris, Mr. William A. Ingham, Mr. Joseph Zentmayer, Prof. E. Otis Kendall.

Announcements were made of the death of M. Karl Chevalier Rousseau d'Happoncourt, Captain of the Imperial and Royal Ship of the Line, *Frundsberg*, at Pola, Austria, October 26, 1893, æt. 51; and of Prof. Hermann August Hagen, Cambridge, Mass., November 9, 1893, æt. 76.

The President reported the appointment of Mr. McKean to

prepare the obituary notice of Mr. Furman Sheppard, and that he had accepted the same.

The President reported the appointment of C. Stuart Patterson, Esq., a member of the Henry M. Phillips Prize Essay Committee, to fill the vacancy occasioned by the death of the late Furman Sheppard.

A paper on "The Conservation of Osmazome in Roasting," was read by Mr. R. Meade Bache.

Prof. Cope presented for the Proceedings a "Second Contribution to the Batrachia and Reptilia of Costa Rica."

The proceedings of the Board of Officers and Council were submitted, as follows:

COUNCIL.

Stated Meeting, November 10, 1893, 8 P.M.

Present: Messrs. Phillips, Tatham, Horn, Morris, Brinton.

Dr. Cattell in the chair.

Minutes of last meeting were read, and after discussion were adopted.

A letter from the President was read, stating that, owing to a prior engagement, he was unable to attend, and suggesting, should anything be laid before Council of sufficient importance, a special meeting should be called. [See letter file, 1893.]

Pending nomination No. 1249, which had been referred by the Society to the Council, was taken up and considered. A letter from pending nomination 1249, soliciting membership, was read. After discussion it was unanimously the opinion of the Board that the old custom of the Society in regarding as disqualified a person who has solicited membership in the Society was a good rule, and should be continued.

On motion of Dr. Brinton, seconded by Dr. Morris, pending nomination No. 1249 was laid on the table.

On motion of Dr. Brinton, Messrs. Brinton, Phillips and Morris were appointed a Committee to prepare for election to membership a list of distinguished men [pursuant to the Laws of the Society, Chap. vii, Sec. 4] "of our own or foreign countries, as may in their judgment merit such distinction;" and to report such list at the next stated regular meeting of Council.

Prof. Haupt, who was present by invitation, explained fully the nature and object of the proposed Atlantic Coast Ship Canal, from New York to the South; and stated that, in his opinion, the best method in which the Society could coöperate was by helping to create and enforce a public sentiment in favor of the project. After discussion it was

Resolved, That when the Board of Officers and Council adjourn this evening, it shall be

adjourned to meet at the call of the President, at such time and place as he shall designate, to consider a memorial on the subject to Congress, the rough draft of which will be prepared for submission at that time by Prof. Haupt.

And at 9.30 P.M. the Council was adjourned by the presiding member.

Adjourned Meeting, Thursday, November 16, 1893, at 2 P.M.

Present: Messrs. Tatham, Ingham, DuBois, McKean, Morris, Price, Wurtz, Phillips, Cattell.

President Fraley in the chair.

Prof. Haupt, who was present by invitation, explained the object of the meeting, and submitted a preamble and resolutions, which, after discussion and amendment, were unanimously adopted, as follows:

The Board of Officers and Council of the American Philosophical Society, to whom was referred the question of the ship canal along the Atlantic coast, has the honor to report:

That after due consideration of the subject in its various bearings, it would recommend the Society to prepare and transmit a memorial to Congress urging definite and immediate action by the United States, and to this end it has prepared the accompanying draft of the same, which is respectfully submitted as a basis for action.

Whereas, The construction of interior deep draught water communication along the seaboard is of the utmost importance in a military point of view, and would have great incidental commercial advantages in time of peace; it is, therefore,

Resolved, That the American Philosophical Society respectfully memorializes your honorable bodies to make such appropriations for the examinations, surveys and reports upon the more important links in this system, especially as to the connection between New York bay and Delaware river, and between Delaware bay and Elk river, as in your judgment may be considered sufficient to inaugurate the work.

And your petitioners will ever pray.

On motion of Dr. Morris, the action on pending nomination 1249 was reconsidered.

Various suggestions and resolutions were offered, and ultimately, upon motion of Dr. Morris, the Council resolved unanimously to report to the Society unfavorably upon nomination 1249.

And at 3.30 P.M. the Council was adjourned by the President.

On motion of Mr. Prime, the consideration of the proposed memorial to Congress was postponed until the next stated meeting of the Society, announcement of the same to be placed on the meeting notices.

The President stated, in reply to a question, that the unfavorable report upon nomination 1249 had the same effect as a similar action upon the part of a committee of a legislative or deliberative body.

New nominations Nos. 1265, 1266, 1267, 1268 and 1269 were read.

Pending nomination 1249 was read.

And the Society was adjourned by the President.

Stated Meeting, December 1, 1893.

Secretary, Dr. BRINTON, in the Chair.

Photographs of Dr. Ruschenberger and Dr. Wurtz were received for the Society's album.

The President reported the following as the Committee under the resolution of Mr. Williams to consider a plan for a general Index of all Transactions, viz.: Messrs. Williams, James, Brinton, Horn, Price.

The death of Thomas M. Cleemann (Nov. 16, 1893, æt. 50) was reported, and the President was authorized to appoint a suitable person to prepare the usual obituary notice. Mr. Frederick Prime was subsequently appointed.

The Treasurer's report was presented and referred to the Finance Committee.

The Publication Committee reported.

The pending resolution relative to the Atlantic Coast Ship Canal was taken up and considered. After discussion by Messrs. Prime, Morris, Haupt, Cope, Dolley, *et al.*, the Society adopted the resolution reported by Council on November 17.

Dr. Cope made an oral communication on "Spermatodus pustulosus," from the Permian beds of Texas.

Pending nominations 1249, 1265, 1266, 1267, 1268 and 1269, and new nominations 1270, 1271, 1272, 1273 and 1274 were read. On motion of Dr. Morris, nominations 1268, 1269, 1270, 1271, 1272, 1273 and 1274, being of non-resident members, were referred to Council to examine and report upon the same before action should be taken thereon by the Society.

And the Society was adjourned by the presiding member.

Stated Meeting, December 15, 1893.

President, Mr. FRALEY, in the Chair.

Dr. Charles Schäffer was presented to the Society and took his seat.

The President reported that the memorial authorized by the Society at its last meeting had been signed, and presented to Congress by Senator Cameron and Representative Harmer.

Letters of envoy were received from the Ministère des Travaux Publics, Paris, France; Société de Geographie de Toulouse, France; Royal Statistical Society, Zoölogical Society, London, Eng.; Royal Irish Academy, Dublin; Literary and Historical Society, Quebec, Canada; Bureau of Ethnology, Washington D. C.; Wisconsin Academy of Sciences, Arts and Letters, Madison; Colorado Scientific Society, Denver, Colo.; Geological Survey of Texas, Austin.

Letters of acknowledgment were received from Institut Egyptien, Cairo (139, 140); Comité Geologique de la Russie, St. Petersburg (139–141); Societas pro Fauna et Flora Fennica, Helsingfors (139–141); Akademia Umiejetnosci, Krakow, Austria (139–141); Prof. Peter R. von Tunner, Leoben, Austria (139–141); Anthropologische Gesellschaft (140, 141); Dr. Friedrich S. Krauss, Vienna, Austria (141); Naturforschende Gesellschaft des Osterlandes, Altenburg (141); Anthropologische Gesellschaft, Berlin, Prussia (141); Universitäts Bibliothek, Bonn, Prussia (141); K. Sächs. Meteorologische Institut, Chemnitz, Saxony (141); Geographische Gesellschaft, Naturhistorische Gesellschaft, Hannover, Prussia (140); Naturwissenschaftlicher Verein für Schleswig-Holstein, Kiel, Prussia (140); K. Säch. Gesellschaft der Wissenschaften (137, 141); Prof. I. Victor Carus, Leipzig, Saxony (141); Société de Physique et d'Histoire Naturelle, Geneva, Switzerland (140); R. Comitato Geologico d'Italia, R. Accademia dei Lincei, Rome, Italy (141); Musée Guimet (141), Dr. Edward Pepper (139, 140), Paris, France; Royal Society (141, and

Trans., xvii, 3; xviii, 1), Geological Society (141, and Trans., xvii, 3; xviii, 1), Dr. W. H. Flower (140, 141), London, Eng.; Radcliffe Observatory, Oxford, Eng. (141, and Trans., xvii, 3; xviii, 1); R. Geological Society of Cornwall, Penzance, Eng. (141); Mr. Joseph Prestwick, Kent, Eng. (139); Academy of Science, Rochester, N. Y. (140, 141); State Mineralogist, San Francisco, Cal. (140, 141); Dr. C. S. Dolley, Philadelphia (140); Smithsonian Institution, Washington, D. C. (137–139); Museo Nacional, Buenos Aires, S. A. (136–138).

Accessions to the library were reported from the Nederlandsche Botanische Vereeniging, Nijmegen; M. Richard Wagner, Jena, Germany; Ministère des Travaux Publics, Paris, France; Victoria Institute, Editors of *Nature*, London, Eng.; Literary and Historical Society, Quebec, Canada; Indian Rights Association, Dr. C. A. Oliver, Mr. Henry Phillips, Jr., Philadelphia; U. S. Coast and Geodetic Survey, Bureau of Ethnology, Washington, D. C.; Academy of Sciences, Austin, Texas; University of California, Berkeley; Agricultural Experiment Station, Fayetteville, Arkansas.

An obituary notice of the late Joseph Zentmayer, by Dr. Charles A. Oliver, was presented.

The following deaths were announced:

Joseph D. Potts, Philadelphia, December 3, 1893, æt. 64.

John Tyndall, London, December 5, 1893, æt. 74.

On motion, the President was authorized to appoint a suitable person to prepare an obituary notice of the late Joseph D. Potts.

The appropriations for the ensuing year were deferred until the next regular meeting of the Society.

This being the evening for balloting for candidates for membership, nominations Nos. 1249, 1265, 1266, 1267 were read, spoken to and balloted for.

Pending nominations Nos. 1268–1274 were read.

A communication entitled, "A Tabulation of the Movement of Civilized Society Westward in the Natural Order of Time," was presented through the Secretaries with a negative recommendation.

On motion, the Secretaries were instructed to return the same to the author as undesirable for publication by the Society.

Dr. Cope presented for the Proceedings a paper by Prof. Jesse W. Hubbard, entitled, "The Yolk Nucleus in *Cymatogaster aggregatus*."

Dr. Cope made some remarks upon the results of late explorations by Mr. Henry C. Mercer, of the Durham Cave of Bucks county, Pa., near Easton, and of Hartman's cave, Monroe county, Pa., near Stroudsburg.

Dr. Brinton spoke of the negative results from the researches heretofore made by Mr. Mercer in American caves, as furnishing no evidence of the existence of a race prior to the Indian inhabitants of this continent.

After all the other business of the meeting was ended, the ballots cast were counted by the Tellers, who reported to the President that the formalities necessary for election to membership had not been fulfilled in the present instance.

And the Society was adjourned by the President.

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*Obituary Notice of Joseph Zentmayer.**

By Charles A. Oliver, M.D.

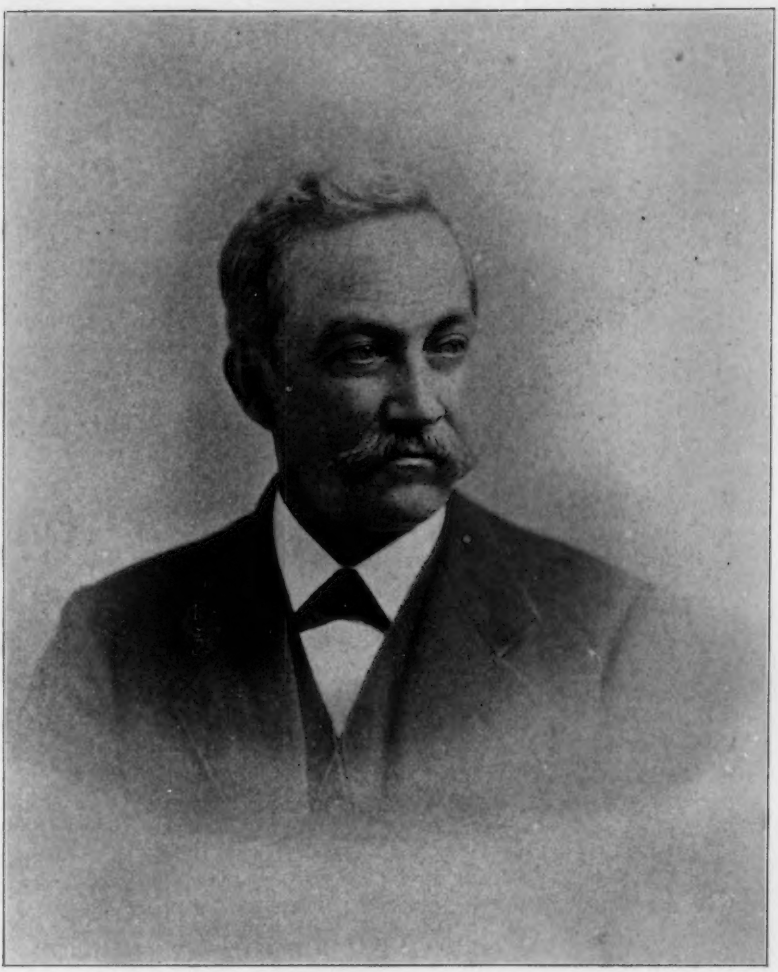
(*Read before the American Philosophical Society, December 15, 1893.*)

"Two things," says Kant, "fill me with awe, the starry heavens and the sense of moral responsibility in man," but how insignificant are these wonderful words to that marvelous expression,

> "Whene'er a noble deed is wrought,
> Whene'er is spoken a noble thought,
> Our hearts in glad surprise
> To higher levels rise. . . . ."

of one of America's greatest teachers of poetical truth. So here, when it becomes the duty of one to give the life history of another greater than

* The writer is under obligations to Prof. Ryder and many others for the facts and dates herein given.



JOSEPH ZENTMAYER.

himself, and to tell that story truthfully to those who have better and greater understanding of the details of that life's work than himself, the task becomes not only necessarily difficult, but doubly a happiness. So to the present memoirist, although knowing the subject of this sketch most intimately in his chosen pursuit, yet he feels a deep sense of duty and doubt in action when confronted with an undertaking which he can do no less than denominate as a labor of love.

His first meeting with Mr. Zentmayer was some thirteen years ago, when he found himself ushered into a most curious little workshop on Fourth street above Walnut street, replete with all manner of cumbersome, peculiarly shaped and intricate devices in what seemed old steel and dirty brass; from the midst of which, the plain though truly honest face of Teutonic type welcomed him with a cheery "Good-morning!"

From that first acquaintanceship, the most revered and kindly friendship existed; a friendship which was only severed and broken upon the day that word came that he was no more—the day when the first knowledge of the loosening of the silver cord and the breaking of the golden bowl that bound and held him with us, was made known.

He left us, not for evermore, but passed from us filled with Beethoven's hope, as he, too, was about to tread into that great unknown way.

"Brüder, über im Sternenzelt
Muss ein lieber Vater wohnen."

Joseph Zentmayer first saw the light of day in Manheim, Baden, on the 27th day of March, 1826. After the completion of his studies in the town gymnasium, he found himself for the first time ushered into that work to which he was destined to contribute so much that is good and so much that is useful. After faithfully serving his apprenticeship with the optician of his native place, and obtaining the foundation of the knowledge and skill which has marked him as a correct analyzer and a wonderfully ingenious contriver of mathematical and optical instrumentation, he further increased his power of observation and improved his technique by associating himself with some of the principal optical establishments in Karlsruhe, Frankfort, Munich and Hamburg. At the last named place, he was under the tutelage of the world-famous Repsold brothers, and there received advantages which he put to account in the later construction of astronomical apparatus.

The rapidity of strength of his character, and the early maturity of his love for individual independence and national liberty made themselves the keys by which the recesses of his future life were opened. Republican in spirit, he actively vouchsafed his nation's unsuccessful stroke for freedom when he was about twenty-two years of age, thus bringing him into this country in the year 1848. For five years he nobly fought his battle of wage-earning in some of the best optical establishments in Baltimore, Washington and Philadelphia, until in 1853, with a single foot-lathe, a stout heart, willing hands, and a steadfast purpose, he began the manu-

facture of mathematical and optical instruments at the corner of Eighth and Chestnut streets.

One of his earliest orders was the construction of a large compound microscope for the late Dr. Paul B. Goddard. The excellence of the instrument and his continually increasing local reputation amongst the prominent scientific men soon secured him the patronage of many of the leading histologists, microscopists and mineralogists. These business connections soon brought with them the pleasant and ever-extending social and scientific associations, so common and so universal amongst those whose life aims are for intellectual good and philosophical research. Although reticent to a degree and unassuming amongst large bodies of men, yet his uncompromising honesty of opinion when sought for, his constant willingness to help solve the most difficult problems in theoretical and applied optics, and the clear, forcible and logical manner with which he grasped and handled any subject in question, made men seekers of him rather than he of them.

Ever thus he was surrounded by distinguished men of all professions and occupations who were interested in microscopical and optical science; men, who as friends and brothers, sought his workshop to take his counsel in the solution of vexed problems in the laws of light; men, who as students came to him to gain his advice as to the best form of construction of instruments of precision; and aye, even overwise tyros willingly found in this patient and unassuming man the calm and dignified correction that they had not supposed themselves able to receive.

Most approachable; always cordial; unbiased in his feelings towards the crudities of individual belief; and unlimited in his liberality in regard to personal and national opinion, he embraced those qualities that make a man lovable, craved for, and sought after.

For nearly a quarter of a century he fought and rapidly subdued many of the vexatious questions in the construction of some of the most important mechanical details of the microscope, thus not only simplifying and perfecting the necessary apparatus, bringing greater ease, more comfort and superior results in technique to the practical microscopist, but obtaining those incentives and inducements for better and increased action. For these endeavors he received those official recognitions, by prize, medal, honorable mention and scientific distinction, that lead all honest and conscientious workers and observers to higher planes of employment.

As early as 1865 he received a diploma as an award for merit from the Massachusetts Charitable Mechanical Association, followed but nine years later by another from the Franklin Institute of this city. How much he was commended for in the receipt of the Elliott Cresson gold medal on the 18th of January, 1875, which was entrusted to the recommendation of the Franklin Institute of the State of Pennsylvania, by the provision of the founder's will, can only be guessed at by the following points of excellence—the marked superiority of general workmanship and finish; the

improved plan of setting the binocular prism; the introduction of a circular rotating and concentric stage; the plan by which exact amplification of the image in the binocular instrument is obtained; the invention of a direct vision-erecting prism; the improved and perfect (mark the word "Perfect") mechanical finger; the optical superiority of the lenses ("the lenses have no superiors"); and lastly, "for the erection and conduct of an optical establishment in our own city wherein work equaling the best done abroad is done on principles of honesty and thorough mechanical skill; and all this as the result of one unaided individual." The Franklin Institute of the State of Pennsylvania also deemed it wise to give a silver medal for the same reasons. These all-sufficient reasons—which were the embodiment of the combined opinion of the Committee on Sciences and the Arts of the Franklin Institute, a committee composed of such representative men as B. Howard Rand, M.D., J. G. Hunt, M.D., George R. Morehouse, M.D., J. Solis Cohen, M.D., E. Otis Kendall, Charles M. Cresson, M.D., E. Thomson and H. C. Wood, Jr., most of whom as members of this Society are now with us in higher and more exalted positions—must bring vividly before us, in this later generation, the admiration and respect with which he was held at that time—a proof of scientific gratitude for individualized success, made still greater when it is known that its award was the second since its founding in the year 1848.

Listen to what the United States Centennial Commission for Awards at the International Exhibition held at Philadelphia in 1876 found sufficient reasons to offer a bronze medal for the microscope stands of Mr. Zentmayer: "For superiority of workmanship, rigidity and freedom from tremor, and the convenient arrangement of their moving parts as unsurpassed by any in use." "Besides the forms already familiar to microscopists, he has presented one which is substantially new, and which embodies a number of important improvements . . . . this exceedingly ingenious stand is in every important respect original with the exhibitor, and is presented as a characteristically American stand." . . . . "The objectives of 3-inch focus, 1½-inch, $\frac{5}{10}$-inch, ½-inch, ¼-inch and ⅛-inch are not surpassed in defining power by those of any other maker." "The resolving power of the ¼ and ⅛-inch is also remarkable." . . . . "For a pocket microscope which folds up without separation of parts into a case, which when in use forms its stand, and is small enough to be carried without inconvenience in the coat pocket." "For an admirable dissecting microscope, furnished at a low price." "Further, of the numerous forms of apparatus accessory to microscopic observations, exhibited by Mr. Zentmayer, may be mentioned as especially worthy of commendation, a very ingenious erecting prism, a mechanical finger for picking up and arranging diatoms and other minute objects," etc.

To this stand he added a most important arrangement, without which no microscope can be considered complete. This consisted in a swinging substage, which, while carrying an achromatic condenser or illuminating apparatus, held a mirror which swung around a pivot placed behind the

stage, of which the axis passed through the object observed, so that the object is in the focus of the illumination in every position. This remarkably ingenious plan of swinging the substage and the mirror so as to have the object as its centre, induced numerous foreign and domestic makers to employ this important principle in optical construction.

Two years later, a third and most important honor was added to the list by the Committee of Awards on Microscopes at the Paris Exhibition, who found fit to give a silver medal and a diploma to Mr. Zentmayer for the superiority, manifold value and simplicity of his workmanship.

Recognizing the value and convenience of the Abbe system of condensing lenses or illuminator in stands that are provided with substages, he modified the ordinary form by so placing the carrier that the diaphragms can be readily changed and arranging the contrivance so that the diaphragm cannot only be moved over the field by rack and pinion, but that it can be revolved. How much we must praise his exquisitely simple, single-prism, total-reflecting camera lucida which is so contrived as to be used either in the upright, angular or horizontal positions of the draw-tube of the microscope.

How exasperatingly easy of comprehension and yet how excellently adapted for their purpose are his contrivances of the life current and siphon-slides so arranged in accordance with Mr. S. D. Holman's ideas that varying degrees of circulation in animalculæ can be made visible, not only to the individual student at work with his highest powers, but actually made recognizable to large audiences during class-work instruction and lecture-room demonstration. Again, the wonderful mechanical construction of Prof. John A. Ryder's automatic microtome, where, with an ordinary razor, tissue-sections of .0025 mm. thickness can be cut by the merest novice, and objects to the length of fifteen centimetres and two centimetres wide can be completely cut serially into almost any desired thickness. Further, the botanical dissecting microscope designed and constructed to meet the requirements of Prof. J. T. Rothrock, of the University of Pennsylvania (a member of this Society), in his botanical class; his clinical stand for accurate examination of any object by a large class, by being passed from hand to hand, that the memoirist has so often used in his student-days; the cheapening and simplification of the microscope so as to bring a properly constructed and adequately working piece of apparatus into the hands of the student of limited means, thus allowing him to become an essential factor in scientific progress: these few contrivances are but a limited number of the mechanical triumphs that resulted from the employment of the never-ceaseless mind of Joseph Zentmayer (the optician), as he proudly styled himself, for more than a half century. Is it any wonder that we exclaim with Von Humboldt, "In the moral world there is nothing impossible, if we bring a thorough will to it. Man can do everything with himself."

An interesting incident in his life is the history of the patent of his doublet photographic lens, which is composed of two deep meniscus lenses

with their convex sides placed outwardly. He made the outer meniscus one-half larger than the back lens, thus allowing six different combinations with seven single lenses. Such a lens having an angle of nearly ninety degrees and great depth of focus, and giving extreme sharpness over the whole field, and being free from all distortion, necessarily became a most excellent instrument for architectural work and copying.

The story of the invention is this: One year before the patent of the lens was obtained, Mr. Coleman Sellers, who was at that time greatly interested in photography, requested Mr. Zentmayer to explain the theory of the then favorably known "Globe lens." Whilst examining a sample of the lens, Mr. Zentmayer remarked, "Why did the inventor adopt an achromatic combination, when the same or even better results could have been obtained by the combination of two simple meniscus lenses? Recognizing the force of the query, Mr. Sellers requested Mr. Zentmayer to experiment with a double lens. This having been successfully accomplished, he urged him to apply for a patent, which was reluctantly agreed to and done after the most earnest solicitation.

The introduction of this lens engendered a most spirited controversy as to question of the theory in optics involved in its construction. Prof. Henry Morton, Dallmeyer and other well-known authoritative scientists and experts, both here and abroad, took part in this discussion. Mr. Zentmayer's personal appearance in the matter, which showed itself in a short article entitled "Refraction without Dispersion and some Reflection," in the August, 1867, number of the *Philadelphia Photographer*, proved at once in a most forcible and logical manner that the writer was a consummate master in the field of theoretical and applied optics; a paper that immediately established him as America's foremost optician.

One monograph, as further illustrating the remarkable clearness, ease of expression and fullness of comprehension with which he surrounded one of the most abstruse and most readily misunderstood of the theoretical and applied sciences—optics—is his illustrated brochure of twenty-three pages entitled "A Lecture on Lenses." This, which appeared in the May and June, 1876, numbers of the *Journal of the Franklin Institute*, is even now authoritatively recognized as one of the best, the most concise, and the clearest expositions of the subject that has ever been presented to the public.

Engaged as the official maker of the microscopes used in the hospitals of the United States Army; appointed a member of the Iowa Total Eclipse Exhibition in 1869, to the success of which he contributed largely by the device of some of the most delicate of the photographic machinery; a member of the Judge of Awards in the 1874 Fair of the Franklin Institute, the International Centennial Exhibition in 1876, and the Electrical Exhibition in 1885; a life-member of the German Hospital, and a member of the American Philosophical Society, the Academy of the Natural Sciences of Philadelphia, both the American and British Associations for the Advancement of Science, the Franklin Institute of Philadelphia, both

the American Society and the New York Society of Microscopists, the Biological and Microscopical Society of Philadelphia, the Philadelphia Photographic Society, the Young Mænnerchor, the Turn-Gemeinde, the Künstlerverein, we can well see that not only was his public work of the most varied character, the most useful to both his city and his country, and of the most value to science, but that his associations were the widest, the most congenial, and the most elevating in character.

Amongst his intimate German friends, his literary knowledge of the authors in his native tongue was well known. Ever a lover of Goethe and the cynical wit of a Heine; deep in the matchless guessings and wonderful intuition of a Von Humboldt, he lived with them the ideal life that always remain ideal to a kindred Teutonic mind.

How much we must praise him when in spite of the fact that he acquired our language (one of the most difficult) after he had gained his majority, he read and reread that never-to-be-repeated series of studies of the human passions by William Shakespeare, enjoyed the young passionate and conscienceless words and thoughts of Byron, laughed and sighed with Burns, walked with Dickens, and followed our own poet laureate, Longfellow.

These associations, as well as those higher correlated ones of music, painting and sculpture, formed both in public life by active membership in various local literary and physical-culture societies, and in the privacy of home with its small, though well-selected collection of works of arts, to which he brought many of his literary and artistic friends, evidence not only his exceptional taste in these the pleasures of higher mental life, but exhibit his acumen and critical judgment in their enjoyment.

After a lingering and extremely sad illness he died in Philadelphia, Pa., on the 28th day of March, 1888.

How can we better do in this meagre sketch than repeat the words of the resolution passed by those nearest and dearest to him in his daily work, his workmen for the last quarter of a century.

Resolved, That we give public expression to our regard for the memory of the late Joseph Zentmayer, as a man whose benevolence, good nature, modesty and friendly disposition endeared him to us through many years of social intimacy; as a workman whose originality, thorough practical skill and energy has made his name known throughout the scientific world; as an employer whose sense of justice and equity equaled his superior natural abilities; as a friend upon whose judicious counsel we could always rely; and that, in our memories, he shall ever be an example of what constitutes a good man."

Justum et tenacem propositi virum.

VOLUMES AND DATES OF PROCEEDINGS AND TRANSACTIONS OF THE AMERICAN PHILOSOPHICAL SOCIETY.

Proceedings.

Vols.	Years.	Numbers.
I.	1838–40.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14.
II.	1841–43.	15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26.
III.	1843.	27.
IV.	1843–47.	28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39.
V.	1848–53.	40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50.
VI.	1854–58.	51, 52, 53, 54, 55, 56, 57, 58, 59, 60.
VII.	1856–60.	61, 62, 63, 64.
VIII.	1861.	65, 66.
IX.	1862–64.	67, 68, 69, 70, 71, 72.
X.	1865–68.	73, 74, 75, 76, 77, 78, 79, 80.
XI.	1869–70.	81, 82, 83, 84, 85.
XII.	1871–72.	86. 87, 88, 89.
XIII.	1873.	90, 91.
XIV.	1875.	92, 93, 94, 95.
XV.	1876.	96.
XVI.	1876–77.	97, 98, 99.
XVII.	1877–78.	100, 101.
XVIII.	1878–80.	102, 103, 104, 105, 106.
XIX.	1880–81.	107, 108, 109.
XX.	1882–83.	110, 111, 112, 113.
XXI.	1883–84.	114, 115, 116.
XXII.	1885.	117, 118, 119, 120. (119 is Part iii, of Vol. xxii ; the early proceedings 1744–1838.)
XXIII.	1886.	121, 122, 123, 124.
XXIV.	1887.	125, 126.
XXV.	1888.	127, 128.
XXVI.	1889.	129, 130.
XXVII.	1889.	131.
XXVIII.	1890.	132, 133, 134.
XXIX.	1891.	135, 136.
XXX.	1892.	137, 138, 139.
XXXI.	1893.	140, 141, 142.
XXXII.	1894.	143, Sesquicentennial Anniversary Volume.

Transactions.

[*Old Series.*]

Vols.	Years.	Vols.	Years.	Vols.	Years.
I.	1759.	III.	1793.	V.	1802.
II.	1786.	IV.	1799.	VI.	1809.

[*New Series.*]

Vols.	Years.	Vols.	Years.	Vols.	Years.
I.	1818.	VII.	1841.	XIII.	1869.
II.	1825.	VIII.	1843.	XIV.	1871.
III.	1830.	IX.	1846.	XV.	1881.
IV.	1834.	X.	1853.	XVI.	1890.
V.	1837.	XI.	1860.	XVII.	1893.
VI.	1839.	XII.	1863.	XVIII.	

INDEX TO VOL. XXXI.

Meetings Held.

	Page.		Page.
1893, January 6	1	1893, May 19	228
January 20	5	September 1	233
February 3	9	September 15	242
February 17	14	October 6	247
March 3	128	October 20	252
March 17	130	November 3	348
April 7	135	November 17	351
April 21	137	December 1	355
May 5	226	December 15	356

New Members Elected.

February 17, 1893.

No. 2210. Hippolyte Taine	Menthone, Haute Savoie, France	16
2211. Charles Schœffer	Philadelphia	16
2212. George Lincoln Goodale	Cambridge, Mass	16
2213. Robert E. Pattison	Harrisburg, Pa	16

May 19, 1893.

No. 2214. Charles P. Daly	New York, N. Y	231
2215. Isaac H. Hall	New York, N. Y	231
2216. Isaac J. Wistar	Philadelphia	231
2217. Edward Vincent d'Invilliers	Philadelphia	231
2218. Waterman L. Hewitt*	Ithaca, N. Y	231
2219. Justin Winsor	Cambridge, Mass	231
2220. William Hyde Appleton	Swarthmore, Pa	231
2221. James E. Rhoads	Bryn Mawr, Pa	231

October 20, 1893.

No. 2222. Samuel A. Green	Boston, Mass	254
2223. John G. Morris	Baltimore, Md	254
2224. J. M. Hoppin	New Haven, Conn	254
2225. Chev. Rousseau d'Happoncourt	Vienna, Austria	254
2226. Isaac Roberts	London, England	254

Decease of Members.

Sir Richard Owen	3	C. C. Jones	242
John O. Westwood	3	Robert Cornelius	242
Eben N. Horsford	3	William H. C. Bartlett	242
Isaac C. Martindale	3	Edward Hopper	246
F. A. Genth	11	John M. Maisch	246
C. Schorlemmer	128	Furman Sheppard	349
Hippolyte Taine	132	Conrad Leemans	349
William B. Rogers	132	Karl Chev. Rousseau d'Happoncourt	352
Isaac Burk	136	Hermann August Hagen	352
Esquiron de Parieu	138	Thomas M. Cleemann	355
Thomas H. Dudley	138	Joseph D. Potts	357
Anthony J. Drexel	241	John Tyndall	357

Obituary Notices.

Page.

Obituary Notice ordered—Isaac C. Martindale by Joseph T. Rothrock 3
F. A. Genth by G. F. Barker 11
Thomas H. Dudley by William John Potts 138
John M. Maisch by Charles S. Dolley 246
Furman Sheppard by Mr. McKean 349, 353
Thomas M. Cleemann by Mr. Frederick Prime 355
Joseph D. Potts 357
Obituary Notices read—William B. Rogers by Dr. Ruschenberger 251, 254
Joseph Zentmayer by Dr. Charles A. Oliver 357, 358

Resignations of Members.

Robert E. Thompson 130
Joseph Allison 348

Acceptance of Membership.

Samuel G. Dixon, Philadelphia 1
James Macfarlane, Lansdowne, Pa . . 1
James Ellis Humphrey, Amherst, Mass 1
George Lincoln Goodale, Cambridge, Mass 128
Charles Schäffer, Philadelphia 128
Robert E. Pattison, Harrisburg, Pa. . . 130
Isaac H. Hall, New York 233
Isaac J. Wistar, Philadelphia 233
Edward Vincent d'Invilliers, Philadelphia 233
Justin Winsor, Cambridge, Mass 233
Waterman L. Hewitt, Ithaca, N. Y . . 233
James E. Rhoads, Bryn Mawr, Pa . . . 233
William Hyde Appleton, Swarthmore, Pa 233
Charles P. Daly, New York 247
Samuel A. Green, Boston, Mass 348
John G. Morris, Baltimore, Md 348
T. M. Hoppin, New Haven, Conn . . . 348

Written Communications.

Page.

BACHE, R. MEADE.

The Conservation of Osmazome in Roasting 318, 353

BAUR, G.

Notes on the Classification and Taxonomy of the Testudinata 210, 227

BOAS, FRANZ.

Vocabulary of the Kwakiutl Language 34

BRINTON, D. G.

The Central American Native Calendar 251, 258
A Vocabulary of the Nanticoke Dialect 325

COPE, E. D.

On the Genus Tomiopsis 317
A New Genus Tomiopsis 350
Batrachia and Reptilia of Costa Rica 353
Second Addition to the Knowledge of the Batrachia and Reptilia of Costa Rica 333, 353

COUES, ELLIOTT.

A Description of the MSS. Journals and Field Notebooks of Lewis and Clark . 9, 17

DOLLEY, CHARLES S. *Page.*

On the Thyrsus of Dionysos, and the Palm Inflorescence of the Winged Figures of Assyrian Monuments 16, 109

DWIGHT, THOMAS.

Observations on the Psoas Parvus and Pyramidalis. A Study of Variation. 117, 132

GENTRY, THOMAS G.

The Fungi of Philadelphia and Its Neighborhood 136, 251

HUBBARD, JESSE W.

The Yolk Nucleus in Cymatogaster aggregatus. 358

LYMAN, B. S.

The Great Mesozoic Fault in New Jersey 246, 247, 314

PACKARD, A. S.

The Life History of Certain Moths of the Family Cochliopodidæ, with Notes on their Spines and Tubercles 11, 83, 132, 139

PHILLIPS, FRANCIS C.

Researches upon the Chemical Properties of Gases 132

RITTER, W. F. McK.

On a New Method of Determining the General Perturbations of the Minor Planets 124, 132

RYDER, JOHN A.

Energy as a Factor in Organic Evolution 136, 192
On the Mechanical Genesis of the Fowl's Egg. 138, 203

SCOTT, W. B.

On the Mammalian Fauna from the Deep River Beds of Montana 251
A Tabulation Movement of Civilized Society Westward in the Natural Order of Time. 357, 358

Oral Communications.

BLODGET, MR.

Maps showing the resources of the State of Pennsylvania for the Chicago World's Fair 231

BRINTON, D. G.

On the meaning of the Mexican Calendar 251
Nanticoke Indian Vocabulary (requested to prepare same for publication) . . . 350

COPE, E. D.

On the fauna of the Eurystylus and Equus beds of the Staked Plains. 11

PROC. AMER. PHILOS. SOC. XXXI. 142. 2 U. PRINTED JAN. 15, 1894.

COPE, E. D. *Page.*

In regard to some stone implements occurring in Maryland, on the Potomac . . 229
On Spermatodus pustulosus 355
The results of late explorations by Mr. Henry C. Mercer 358

HAUPT, L. M.

On the Atlantic Coast Ship Canal 349, 353, 354

PRIME, MR.

On the present revolution taking place in iron making in the United States. . . 138
On the classification of ore deposits, and proposition of a new system 254

RYDER, JOHN A.

The adaptive forms and the vortex motion of the substance of the red corpuscles of vertebrates 231
On the forms of fossil sharks, family Cladodontidæ 254

Miscellaneous.

Academy of Natural Sciences, Philadelphia, letter from in relation to the Keating-Poinsett Collection. 5, 6
Académie de Belgique, Bruxelles, circular requesting subscription to the works of Jean-Servais Stas. 128
American Historical Association, Washington, D. C., communication from. 234
Anthropological Society, Washington, D. C., circular relative to citizenship, prizes to be awarded 233
Atlantic coast ship canal, referred to Committee. 349
Reported on by Committee 353, 354
Memorial to Congress on 355, 356
American Folk Lore Society, circular announcing its annual meeting 2
Appropriations for ensuing year deferred 357
Bressa Prize, announcement of, by R. Academy of Sciences, Turin, Italy 5
Committees:
Standing Committees 8, 9
On Michaux Legacy 7, 8
On Finance, William P. Tatham appointed in place of W. B. Rogers, deceased . . 254
On Publication, reported. 355
To Examine and Report upon a Paper by Francis C. Phillips 132, 136
To Examine Catalogue of Martindale Library, and to purchase any books contained therein, important to the Society 229
To Examine and Report on W. B. Scott's Paper 251, 253
On Phillips Prize Essay, C. Stuart Patterson appointed a member of the Committee 353
To Prepare a General Index of all Transactions 355
Coöperative Index of Transactions 247, 251, 252
Congrès Internationale de Zoologie, circular relative to prizes to be awarded 233
Curators, communication from. 227
Report. 12
Columbia College, New York, circular from, concerning the Loubat Prize. 14
Coues, Dr. Elliott, request for further extension of time to retain the Lewis and Clark MSS 1
Letter thanking the Society for its loan of same 6
Council, Election, annual 3, 4
Minutes of, submitted. 16, 133, 229, 353
Endorses Atlantic coast ship canal. 353, 354
Cramp, Mr. C. H., presented to the chair. 228

Page.

Dercum, Dr. Francis X., presented to the chair 5
Erratum, page 132, line 12 from top, should read, "President was authorized to appoint a suitable person to prepare the usual obituary"
Number commencing the list of newly-elected members should be 2214 instead of 2218 231
Forestry Commission, resolution requesting Senate and House of Representatives to vote in favor of the bill 16
Friesch Genootschap voor Gescheed Oudheid en Taalkunde, Leeuwarden, Friesland, letter announcing the death of three of its members 251
Gadoline, Hon. Axel, death of. 14
Goodwin, Mr. Harold, presented to the chair 1
Hodgkins' Prizes, circular relating to 137
Keating-Poinsett Collection, letter from the Curators of Academy of Natural Sciences relating to the. 2, 5, 6
Letter from Department of Archæology of the University of Pennsylvania requesting the deposit of the 13
Kokcharow, Hon. Nicholas, death of 14
Liberty Bell, phototype of, presented by Mr. F. Gutekunst 241
Librarian nominated. 4
Reëlected 9
Loubat Prize, regulations concerning 14
Macfarlane, Dr., presented to the chair 9

Motions:
To introduce electric lighting into the building 130
Mr. Fraley, in reference to the Haldeman Indian Collection 227
Dr. Morris, Curators to dispose of objects of no value 227
Dr. Morris, Nominations 1271–1274 referred to Council 355
Mr. Prime, memorial to Congress considered 354
Mr. Smyth, Nanticoke Indian Vocabulary to be prepared for publication 350
Mr. Williams, Coöperative Index of Transactions. 247, 251, 252
Nanticoke Indian Vocabulary 350
Naturhistorische Verein der Preussischen Rheinlande, etc., Bonn, Prussia, invitation to celebration of its fiftieth anniversary 247
Niederrheinische Gesellschaft für Natur- und Heilkunde, Bonn, Prussia, invitation to celebration of its seventy-fifth anniversary 247
New Exchanges ordered 1, 130, 348
New Haven Colony Historical Society, invitation to dedication of new building . . . 233
New York State Library, Albany, letter from, asking the Society to exhibit its publications at the Columbian Celebration 5
Nominations read 4, 9, 11, 16, 130, 132, 136, 138, 227, 229, 247, 251, 254, 354, 355, 357
Balloted for—Nos. 1235, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259. . 16, 229
Nos. 1260, 1261, 1262, 1263, 1264. 254
Nos. 1249, 1265, 1266, 1267 357
Pedessalli, Prof. D. Guiseppe, death of. 14

Photographs received:
Dr. F. A. Genth and Prof. F. A. Genth, Jr. 136
Dr. Isaac H. Hall. 241
Mr. Henry C. Baird. 241
Dr. Charles A. Oliver. 241
Dr. F. A. Muhlenberg 241
Mr. Robert P. Field 251
Hon. Frederick Fraley. 352
Dr. D. G. Brinton. 352
Dr. J. C. Morris. 352
Mr. William A. Ingham 352
Mr. Joseph Zentmayer 352

Photographs received : *Page.*
Prof. E. Otis Kendall. 352
Dr. Ruschenberger. 355
Dr. Wurtz 355
Portrait of John Vaughan exhibited and deposited 4
Portrait received, Matthew Carey, and thanks returned to Mr. Henry C. Baird for same 227
Prime, Mr. Frederick, on a new gold field in W. Australia. 350
Reports :
Curators', relative to the requested loan of objects for the World's Fair Columbian Exposition 11, 12
Curators upon the collections of the Society 12
Of Treasurer presented. 355
Of Publication Committee 355
Resolutions :
Dr. Cope, exhibition of mental or physical deformities 136, 137
Mr. Du Bois, in reference to loan of articles for the Chicago Exposition 12
Dr. J. C. Morris, Atlantic coast ship canal. 350
Dr. Rothrock, in reference to Forestry Commission 16
Rhoads, Dr. James E., presented to the chair 252
Royal Academy of Sciences, Turin, Italy, circular announcing its offer of the ninth Bressa Prize 5
Sesqui-Centennial Celebration, Prof. Cope requested information about the programme of 227
Schäffer, Dr. Charles, presented to the chair. 356
Society's Collections, question of withdrawing the Society's Collection on deposit in other institutions 132, 133
Tomiopsis, Dr. Cope on 350
University of Missouri, request for certain numbers of the Proceedings 242
U. S. Coast and Geodetic Survey, Washington, D. C., letter requesting certain numbers of Proceedings and Transactions. 233
Volumes and dates of Proceedings and Transactions 365
Wadsworth Athenæum, Hartford, invitation to attend the opening of the new Libraries and Art Galleries. 1
Wistar, Mrs. Mifflin, presented to the Society a collection of letters to Dr. Caspar Wistar. 244, 245
Thanks tendered to, for same 246
World's Columbian Exposition, Curators report relative to requested loan of objects for the 11, 12
Circular from Bureau of Education, Washington, D. C., in regard to the Educational Exhibit 14
Mr. Blodget's maps showing the resources of Pennsylvania for the 231
Wyoming Historical and Geological Society, Wilkesbarre, Pa., invitation to opening of its new building 351

LIST OF SURVIVING MEMBERS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA

FOR

PROMOTING USEFUL KNOWLEDGE.

Corrected to January 5, 1894,

BY

HENRY PHILLIPS, JR.,

A Secretary of the Society.

List of surviving Members of the American Philosophical Society, held at Philadelphia for Promoting Useful Knowledge.

The addresses here given so far as known are at the present time. Corrections of this list are respectfully solicited.

A name printed in *italics* indicates that the Society is uncertain as to whether such member is still living and desires information on the subject.

The Society will be happy to receive *photographs* (cabinet size preferred) of such of its members as have not already sent.

A

	Name.	*Date of Election.*	*Present Address.*
1687.	ABBÉ, CLEVELAND.	July 21, 1871,	Army Weather Bureau, Washington, D. C.
2170.	ABBOTT, CHARLES C.	Dec. 20, 1889,	Bristol, Pa.
1463.	ABBOT, HENRY L.	April 18, 1862,	New York city, N. Y.
1809.	ÅCKERMAN, RICHARD	July 21, 1876,	Stockholm, Sweden.
1713.	ACLAND, HENRY W.	Jan'y 17, 1873,	Oxford, England.
2128.	ADAM, LUCIEN.	Dec. 17, 1886,	Rennes, France.
2081.	ADAMS, H. B.	May 21, 1886,	Baltimore, Md.
1381.	*Adamson, Rev. John C.*	July 13, 1856.	
1779.	AGASSIZ, ALEXANDER	April 16, 1875,	Cambridge, Mass.
1612.	AGASSIZ, ELIZABETH.	Oct. 15, 1869,	" "
2091.	ALBRECHT, PAUL.	May 21, 1886,	Hamburg, Germany.
1860.	ALISON, ROBERT H.	May 3, 1878,	Ardmore, Pa.
1869.	ALLEN, JOEL ASAPH	Sept. 20, 1878,	New York, N. Y.
1927.	AMES, CHARLES G.	Jan'y 21, 1881,	Boston, Mass.
2064.	ANDERSON, GEORGE B.	Feb'y 19, 1886,	West Point, N. Y.
1655.	ANDERSON, GEORGE W.	Oct. 15, 1869,	Rosemont, Pa.
2164.	ANGELL, JAMES B.	Oct. 18, 1889,	Ann Arbor, Mich.
1122.	*Angelis, Pedro de.*	Jan'y 17, 1840,	*Buenos Ayres, S. A.*
2224.	APPLETON, WILLIAM HYDE . . .	May 19, 1893,	Swathmore, Pa.
2102.	ARGYLL, DUKE OF.	May 21, 1886,	London, England.
1761.	ARMSTRONG, WM. GEORGE . . .	July 17, 1874,	Newcastle-on-Tyne, England.
1996.	ASHHURST, JOHN.	Jan'y 18, 1884,	Philadelphia.
2012.	ASHHURST, RICHARD L.	April 18, 1884,	"

B

	Name.	Date of Election.	Present Address.
1995.	BACHE, R. MEADE	Jan'y 18, 1884,	Philadelphia.
1832.	BACHE, THOMAS HEWSON	Feb'y 2, 1877,	"
1630.	BAIRD, HENRY CAREY	Jan'y 15, 1869,	"
1991.	BAIRD, HENRY M.	Jan'y 18, 1884,	Yonkers, N. Y.
2075.	BAKER, WILLIAM S.	May 21, 1886,	Philadelphia.
2191.	BALL, ROBERT S.	May 15, 1891,	Dublin, Ireland.
1936.	BARBER, EDWIN ATLEE	April 15, 1881,	West Chester, Pa.
1818.	BARCENA, MARIANO	Feb'y 2, 1877,	Mexico.
1741.	BARKER, GEORGE F.	April 18, 1873,	Philadelphia.
2011.	BARKER, WHARTON	April 18, 1884,	"
2144.	BARNARD, WILLIAM T.	May 20, 1887,	Boonton, N. J.
1902.	BARTHOLOW, ROBERTS	April 16, 1880,	Philadelphia.
1133.	BARTLETT, W. H. C.	April 17, 1840,	Yonkers, N. Y.
2119.	BASTIAN, ADOLPH	Dec. 17, 1886,	Berlin, Germany.
1968.	BELL, ALEXANDER GRAHAM	July 21, 1882,	Washington.
1966.	BELL, JOSEPH SNOWDEN	July 21, 1882,	Philadelphia.
1802.	BELL, LOWTHIAN	April 21, 1876,	Northallerton, England.
2149.	BIDDLE, ALEXANDER	Feb'y 17, 1888,	Philadelphia.
2154.	BIDDLE, ARTHUR	Dec. 21, 1888,	"
1920.	BIDDLE, CADWALADER	Oct. 15, 1880,	"
1831.	BIDDLE, CRAIG	Feb'y 2, 1877,	"
2134.	BILLINGS, JOHN S.	Feb'y 18, 1887,	Washington, D. C.
2157.	BLAIR, ANDREW A.	May 17, 1889,	Philadelphia.
1554.	BLAIR, THOMAS S	Jan'y 19, 1866,	Pittsburgh, Pa.
1669.	BLAKE, WILLIAM PHIPPS	Oct. 21, 1870,	New Haven, Conn.
1790.	BLASIUS, WILLIAM	Oct. 15, 1875,	Philadelphia.
1700.	BLODGET, LORIN	April 19, 1872,	"
1444.	BÖHTLINGK, OTTO	Jan'y 17, 1862,	Leipzig, Germany.
2047.	BONWILL, W. G. A.	Oct. 16, 1885,	Philadelphia.
1126.	BOYÉ, MARTIN H.	Jan'y 17, 1840,	Coopersburg, Pa.
1826.	BRACKETT, CYRUS FOGG	Feb'y 2, 1877,	Princeton, N. J.
2083.	BRANNER, JOHN C.	May 21, 1886,	Palo Alto, Cal.
2195.	BREZINA, ARISTIDES	May 21, 1886,	Vienna, Austria.
1636.	BRINTON, DANIEL G.	April 16, 1869,	Philadelphia.
2069.	BRINTON, JOHN H.	Feb'y 19, 1886,	"
1745.	BRITTON, J. BLODGETT	Oct. 17, 1873,	"
2080.	BROOKS, WILLIAM KEITH	May 21, 1886,	Baltimore, Md.
1881.	BROWN, ARTHUR ERWIN	April 18, 1879,	Philadelphia.
1333.	BROWN-SEQUARD, E.	Jan'y 20, 1854,	Paris, France.
1614.	BRUGSH, HENRI	Jan'y 15, 1869,	Berlin, Prussia.
1547.	BRUSH, GEORGE J.	Jan'y 20, 1865,	New Haven, Conn.
1653.	BULLOCK, CHARLES	Oct. 15, 1869,	Philadelphia.
1452.	BUNSEN, ROBERT W.	Jan'y 17, 1862,	Heidelberg, Germany.
2007.	BURK, JESSE Y.	Jan'y 18, 1884,	"
1938.	BUTLER, WILLIAM	April 15, 1881,	West Chester, Pa.

C

1788.	CAMPBELL, JOHN LYLE	July 16, 1875,	Crawfordsville, Ind.
1606.	CANBY, WILLIAM MARRIATT	Oct. 16, 1868,	Wilmington, Del.
2051.	CANNIZZARO, TOMMASO	Oct. 16, 1885,	Messina, Italy.
1731.	CAPELLINI, GIOVANNI	April 18, 1873,	Bologna, Italy.
1796.	CARLL, J. F.	Oct. 15, 1875,	Pleasantville, Pa.
2130.	CARRILLO, CRESCENCIO	Dec. 17, 1886,	Merida, Yucatan.
1911.	CARSON, HAMPTON L.	April 16, 1880,	Philadelphia.

	Name.	*Date of Election.*	*Present Address.*
1707.	CASSATT, ALEXANDER JOHNSON	Oct. 18, 1872,	Philadelphia.
2147.	CASTNER, SAMUEL, JR.	Dec. 16, 1887,	"
2152.	CATTELL, J. MCKEEN	May 18, 1888,	New York, N. Y.
1675.	CATTELL, WILLIAM C.	Jan'y 20, 1871,	Philadelphia.
1908.	CHANCE, HENRY MARTYN	April 16, 1880,	"
1783.	CHANDLER, C. F.	April 16, 1875,	New York, N. Y.
1778.	CHAPMAN, HENRY C.	April 16, 1875,	Philadelphia.
2132.	CHARENCEY, COMTE HYACINTH DE	Dec. 17, 1886,	St. Maurice les Charencey France.
2111.	CHILDS, GEORGE W.	Dec. 17, 1886,	Philadelphia.
2158.	CLARK, CLARENCE H.	May 17, 1889,	"
1717.	CLARKE, THOMAS C.	Jan'y 17, 1873,	New York, N. Y.
1983.	CLAYPOLE, E. W.	Jan'y 19, 1883,	Akron, Ohio.
1876.	CLOISEAUX, DES, A.	Oct. 18, 1879,	Paris, France.
1999.	COHEN, J. SOLIS	Jan'y 18, 1884,	Philadelphia.
2005.	COLERIDGE, LORD	Jan'y 18, 1884,	London, England.
1555.	COPE, EDWARD D.	Jan'y 19, 1866,	Philadelphia.
1367.	COPPÈE, HENRY	Jan'y 18, 1856,	Bethlehem, Pa.
2129.	CORA, GUIDO	Dec. 17, 1886,	Turin, Italy.
1867.	COUES, ELLIOTT	Sept. 20, 1878,	Washington, D. C.
1662.	COX, J. D.	April 15, 1870,	Cincinnati, O.
1672.	COXE, ECKLEY B.	Oct. 21, 1870,	Drifton, Pa.
2207.	CRAMP, CHARLES H	Dec. 16, 1892,	Philadelphia.
1836.	CRANE, THOMAS F.	Feb'y 2, 1877,	Ithaca, N. Y.
2100.	CROOKES, WILLIAM	May 21, 1886,	London, England.
2172.	CRUZ, FERNANDO (of Guatemala)	Dec. 20, 1889.	
1439.	CURWEN, JOHN	April 18, 1861,	Warren, Pa.

D

1567.	DA COSTA, J. M.	Oct. 19, 1866,	Philadelphia.
2214.	DALY, CHARLES P.	May 19, 1893,	New York, N. Y.
1354.	DANA, JAMES D	July 21, 1854,	New Haven, Conn.
1808.	DANNEFELD, C. JUHLIN	April 21, 1876,	Stockholm, Sweden.
1516.	DAUBRÉE, A.	July 17, 1863,	Paris, France.
1811.	DAVENPORT, SAMUEL.	Oct. 20, 1876,	Adelaide, S. Australia.
1557.	DAVIDSON, GEORGE.	Jan'y 19, 1866,	San Francisco, Cal.
1923.	DAWKINS, WILLIAM B	Oct. 15, 1880,	Manchester, England.
1468.	DAWSON, JOHN W	April 18, 1862,	Montreal, Canada.
2131.	DELGADO, JUAN DE DIAS DE LA RADA Y.	Dec. 17, 1886,	Madrid, Spain.
2208.	DERCUM, FRANCIS X.	Dec. 16, 1892,	Philadelphia.
2013.	DICKSON, SAMUEL	April 18, 1884,	"
2208.	DIXON, SAMUEL G.	Dec. 16, 1892,	"
2108.	DOLLEY, CHARLES S.	Dec. 17, 1886,	"
2089.	DONNER, OTTO.	May 21, 1886,	Helsingfors, Finland.
1946.	DOOLITTLE, C. L.	Oct. 21, 1881,	Bethlehem, Pa.
1839.	DOUGLASS, JAMES, JR.	April 20, 1877,	Spuytenduyvil, N. Y.
1924.	DRAPER, DANIEL	Oct. 15, 1880,	New York, N. Y.
1787.	DROWN, THOMAS M	July 16, 1875,	Boston, Mass.
1918.	DU BOIS, PATTERSON	Oct. 15, 1880,	Philadelphia.
1878.	DUDLEY, CHARLES BENJAMIN	Jan'y 17, 1879,	Altoona, Pa.
2063.	DUNCAN, LOUIS	Feb'y 19, 1886,	U. S. Navy.
1573.	DUNNING, GEORGE F.	Jan'y 18, 1867,	Farmington, Conn.
1727.	DUPONT, EDOUARD	April 18, 1873,	Brussels, Belgium.
2086.	DURUY, VICTOR	May 21, 1886,	Paris, France.
1679.	DUTTON, CLARENCE E.	Jan'y 20, 1871,	Washington, D. C.

E

	Name.	*Date of Election.*	*Present Address*
2105.	EASTON, MORTON W.	Dec. 17, 1886,	Philadelphia.
1917.	ECKFELDT, JACOB B	Oct. 15, 1880,	"
1825.	EDDY, HENRY T.	Feb'y 2, 1877,	Terre Haute, Ind.
1686.	ELIOT, CHARLES W.	April 21, 1871,	Cambridge, Mass.
1981.	EMMONS, S. F.	Jan'y 19, 1883,	Washington, D. C.
1943.	EVANS, JOHN	Oct. 21, 1881,	Hemel Hempstead, Eng.

F

2180.	FIELD, ROBERT PATTERSON	May 16, 1890,	Philadelphia.
1901.	FLINT, AUSTIN, JR	April 16, 1880,	New York, N. Y.
1621.	FLOWER, WM. HENRY.	Jan'y 15, 1869,	London, England.
1875.	FOGGO, EDWARD A.	Oct. 18, 1879,	Philadelphia.
2197.	FORBES, GEORGE	Oct. 16, 1891,	London, England.
1170.	FRALEY, FREDERICK	July 15, 1842,	Philadelphia.
1912.	FRALEY, JOSEPH C.	April 16, 1880,	"
1695.	FRAZER, PERSIFOR	Jan'y 19, 1872,	"
2171.	FRIEBIS, GEORGE	Dec. 20, 1889,	"
1459.	FROUDE, J. A.	Jan'y 17, 1862,	London, England.
2179.	FULLERTON, GEORGE S.	May 16, 1890,	Philadelphia.
1739.	FULTON, JOHN.	April 18, 1873,	Johnstown, Pa.
1914.	FURNESS, HORACE HOWARD	April 16, 1880,	Philadelphia.
1130.	FURNESS, WILLIAM H.	April 17, 1840,	"

G

1988.	GARRETT, PHILIP C	April 20, 1883,	Philadelphia.
2079.	GATES, M. E	May 21, 1886,	Amherst, Mass.
1025.	GATSCHET, ALBERT S.	Oct. 17, 1884,	Washington, D. C.
1897.	GEIKIE, ARCHIBALD	Jan'y 16, 1880,	London, England.
1803.	GEIKIE, JAMES.	April 21, 1876,	Edinburgh, Scotland.
2067.	GENTH, F. A., JR.	Feb'y 19, 1886,	Philadelphia, Pa.
1355.	GIBBS, OLIVER WOLCOTT.	July 21, 1854,	Cambridge, Mass.
1587.	GILL, THEODORE NICHOLAS	July 19, 1867,	Washington, D. C.
1800.	GILMAN, DANIEL C.	April 21, 1876,	Baltimore, Md.
1940.	*Giraldes, J. P. C. Cassado de.*	July 20, 1827.	
1950.	GLADSTONE, WM. EWART	Oct. 21, 1881,	London, England.
2212.	GOODALE, GEORGE LINCOLN	Feb. 17, 1893,	Cambridge, Mass.
2162.	GOODE, G. BROWN	Oct. 18, 1889,	Washington, D. C.
1835.	GOODELL, WILLIAM	Feb'y 2, 1877,	Philadelphia.
1680.	GOODFELLOW, EDWARD.	Jan'y 20, 1871,	Washington, D. C.
2203.	GOODWIN, HAROLD	May 20, 1892,	Philadelphia.
1271.	GOULD, BEN. APTHORP	Jan'y 17, 1851,	Cambridge, Mass.
1851.	GRAY, ELISHA.	Jan'y 18, 1878,	Chicago, Ill.
1605.	GREEN, TRAILL	Oct. 16, 1868,	Easton, Pa.
1504.	GREEN, WILLIAM HENRY	April 17, 1863,	Princeton, N. J.
1880.	GREENE, WILLIAM H.	April 18, 1879,	Philadelphia.
2155.	GREGORIO, IL MARCHESE ANTONIO DE	Dec. 21, 1888,	Palermo, Italy.
2159.	GREGORY, HENRY D.	May 17, 1889,	Philadelphia.
2188.	GREGORY, CASPAR RÉNÉ.	May 15, 1891,	Leipzig.
1229.	*Grimaldi, Ceva*	Oct. 16, 1846,	*Naples, Italy.*
1939.	GRISCOM, WM. WOODNUTT	April 15, 1881,	Haverford, Pa.
1815.	GROTE, AUGUSTUS RADCLIFFE	Oct. 20, 1876.	
2090.	GUBERNATIS, ANGELO DE	May 21, 1886,	Florence, Italy.
1438.	*Guyangos, Pascual de.*	April 19, 1861,	*Madrid, Spain.*

H

	Name.	*Date of Election.*	*Present Address.*
2054.	HAECKEL, ERNEST.	Oct. 16, 1885,	Jena, Prussia.
1658.	HALE, EDW. EVERETT	Jan'y 21, 1870,	Roxbury, Mass.
1709.	HALE, HORATIO	Oct. 18, 1872,	Clinton, Canada.
1853.	HALL, ASAPH	Jan'y 18, 1878,	Washington, D. C.
1795.	HALL, CHARLES EDWARD.	Oct. 15, 1875,	Westport, N. Y.
2219.	HALL, ISAAC H	May 19, 1893,	New York, N. Y.
1356.	HALL, JAMES	July 21, 1854,	Albany, N. Y.
2027.	HALL, LYMAN B	Jan'y 16, 1885,	Haverford, Pa.
1412.	HAMMOND, WILLIAM A	Oct. 21, 1859,	New York, N. Y.
2194.	HAMY, E. T.	May 15. 1891,	Paris, France.
1337.	HARDING, GEORGE	Jan'y 20, 1854,	Philadelphia.
2136.	HARRIS, JOSEPH S.	May 20, 1887,	"
1827.	HART, JAMES MORGAN.	Feb'y 2, 1877,	Ithaca, N. Y.
1510.	HARTSHORNE, HENRY.	July 17, 1863,	Philadelphia.
1764.	HAUER, FRANZ RITTER VON. . .	Oct. 16, 1874,	Vienna, Austria.
1681.	HAUPT, HERMANN.	April 21, 1871,	St. Paul, Minn.
1862.	HAUPT, LEWIS M.	May 3, 1878,	Philadelphia.
2082.	HAYES, R. SOMERS.	May 21, 1886,	New York, N. Y.
2071.	HAYS, J. MINIS	Feb'y 19, 1886,	Philadelphia.
2165.	HAZLEHURST, HENRY	Oct. 18, 1889,	"
1985.	HEILPRIN, ANGELO	April 20, 1883,	"
1734.	HELMHOLTZ, HEINRICH	April 18, 1873,	Berlin, Prussia.
2222.	HEWITT, WATERMAN L	May 19, 1893,	Ithaca, N. Y.
1963.	HILL, HAMILTON ANDREWS . . .	April 21, 1882,	Boston, Mass.
2110.	HILPRECHT, HERMANN V.	Dec. 17, 1886,	Philadelphia.
1768.	HIMES, CHARLES FRANCIS . . .	Oct. 16, 1874,	Carlisle, Pa.
1663.	HITCHCOCK, CHARLES HENRY . .	April 15, 1870,	Hanover, N. H.
2160.	HOFFMAN, WALTER J.	Oct. 18, 1889,	Washington, D. C.
2068.	HOLLAND, JAMES W.	Feb'y 19, 1886,	Philadelphia.
1898.	HOLMES, OLIVER WENDELL . . .	Jan'y 16, 1880,	Boston, Mass.
1624.	HOOKER, JOSEPH D.	Jan'y 15, 1869,	London, England.
1607.	HORN, GEORGE HENRY	Oct. 16, 1868,	Philadelphia.
2070.	HORNER, INMAN.	Feb'y 19, 1886,	"
1941.	HOTCHKISS, JEDEDIAH.	Oct. 21, 1881,	Staunton, Va.
1696.	HOUGH, GEORGE W.	Jan'y 19, 1872,	Evanston, Ill.
1698.	HOUSTON, EDWIN J.	Jan'y 19, 1872,	Philadelphia.
2143.	HOUSTON, HENRY H	May 20, 1887,	"
2084.	HOVELACQUE, ABEL	May 21, 1886,	Paris, France.
1843.	HUMPHREY, H. C	July 20, 1877.	
2211.	HUMPHREY, JAMES ELLIS	Dec. 16, 1892,	Amherst, Mass.
1623.	HUXLEY, THOMAS HENRY	Jan'y 15, 1869,	London, England.
1426.	HYRTL, JOSEPH	July 20, 1860,	Vienna, Austria.

I

2052.	IM THURN, EVERARD F.	Oct. 16, 1885,	Georgetown, British Guiana.
2221.	D'INVILLIERS, EDWARD VINCENT.	May 19, 1893,	Philadelphia.
1773.	INGHAM, WM. ARMSTRONG. . . .	April 16, 1875,	"

J

2010.	JAMES, EDMUND J	April 18, 1884,	Philadelphia.
1933.	JANNET, CLAUDIO	April 15, 1881,	Paris, France.
2049.	JAYNE, HORACE	Oct. 16, 1885,	Philadelphia.
1954.	JEFFERIS, WILLIAM W	Jan'y 20, 1882,	"
2017.	JORDAN, FRANCIS, JR.	April 18, 1884,	"

K

	Name.	*Date of Election.*	*Present Address.*
1989.	KANE, ELISHA KENT.	April 20, 1883,	Kane, Pa.
2169.	KEANE, JOHN J.	Dec. 20, 1889,	Washington, D. C.
1348.	KEATING, WILLIAM V	April 21, 1854,	Philadelphia.
2021.	KEEN, WILLIAM W.	July 18, 1884,	"
1723.	KELVIN, LORD (WM. THOMSON). .	April 18, 1873,	London, England.
2118.	KIEPERT, HENRI.	Dec. 17, 1886,	Berlin, Prussia.
1161.	KENDALL, E. OTIS	Jan'y 21, 1842,	Philadelphia.
1708.	KING, CLARENCE	Oct. 18, 1872,	New York, N. Y.
1284.	KIRKWOOD, DANIEL	April 18, 1851,	Riverside, Cal.
1767.	KÖNIG, GEORGE A	Oct. 16, 1874,	Houghton, Mich.
2167.	KRAUSS, FRIEDERICH S	Dec. 20, 1889,	Vienna, Austria.

L

1694.	LAMBERT, GUILLAUME.	Jan'y 19, 1872,	Louvain, Belgium.
1858.	LANDRETH, BURNET.	Jan'y 18, 1878,	Bristol, Pa.
1781.	LANGLEY, SAMUEL P.	April 16, 1875,	Washington, D. C.
1721.	LA ROCHE, C. PERCY	Jan'y 17, 1873,	Rome, Italy.
1711.	LAUTH, FRANZ JOSEPH	Oct. 18, 1872,	Munich, Bavaria.
1974.	LAWES, JOHN BENNETT	Jan'y 19, 1883,	Rothamstead, Herts, Eng.
1595.	LEA, HENRY CHARLES.	Oct. 18, 1867,	Philadelphia.
1737.	LE CONTE, JOSEPH.	April 18, 1873,	Berkeley, Cal.
1986.	LEHMAN, AMBROSE E.	April 20, 1883,	Philadelphia.
2182.	LELAND, CHARLES G.	May 16, 1890,	London, Eng.
2174.	LE MOINE, J. M.	Dec. 20, 1889,	Quebec, Canada.
1934.	LE ROY-BEAULIEU, PAUL.	April 15, 1881,	Paris, France.
1382.	LESLEY, J. PETER	July 13, 1856,	Philadelphia.
1376.	LETCHWORTH, ALBERT S.	Jan'y 18, 1856,	"
2085.	LEVASSEUR, EMILE.	May 21, 1886,	Paris, France.
1415.	LEWIS, FRANCIS W.	Jan'y 20, 1860,	Philadelphia.
1383.	LEYBURN, JOHN.	July 13, 1856,	Baltimore, Md.
1756.	LOCKYER, JOSEPH NORMAN. . . .	April 17, 1874,	London, England.
2202.	LOW, SETH	Feb. 19, 1892,	New York, N. Y.
1872.	LONGSTRETH, MORRIS	Sept. 20, 1878,	Philadelphia.
2019.	LUBBOCK, JOHN	July 18, 1884,	London, England.
2003.	LUDLOW, WILLIAM.	Jan'y 18, 1884,	U. S. A.
1629.	LYMAN, BENJAMIN SMITH	Jan'y 15, 1869,	Philadelphia.

M

2107.	MACALISTER, JAMES	Dec. 17, 1886,	Philadelphia.
2209.	MACFARLANE, JOHN M.	Dec. 16, 1892,	Lansdowne, Pa.
1970.	MALLERY, GARRICK, JR	Oct. 20, 1882,	Washington, D. C.
2042.	MALLET, JOHN WM.	Jan'y 16, 1885,	University of Virginia, Va
1847.	MANSFIELD, IRA FRANKLIN . . .	Jan'y 18, 1878,	Cannelton, Pa.
1857.	MARCH, FRANCIS ANDREW . . .	Jan'y 18, 1878,	Easton, Pa.
1861.	MARKS, WILLIAM D	May 3, 1878,	Philadelphia.
1604.	MARSH, OTHNIEL C	Oct. 16, 1868,	New Haven, Conn.
2078.	MARSHALL, JOHN	May 21, 1886,	Philadelphia.
1018.	*Martínez, Juan José*	April 20, 1832,	*Spain.*
2184.	MASCART, E.	Dec. 19, 1890,	Paris, France.
1572.	MASON, ANDREW	Jan'y 18, 1867,	New York, N. Y.
2196.	MASPERO, GASTON	May 15, 1891,	Paris, France.
1654.	MAYER, ALFRED M	Oct. 15, 1869,	Hoboken, N. J.
1928.	MCCAULEY, EDWARD Y	Jan'y 21, 1881.	Philadelphia.
1685.	MCCOSH, JAMES	April 21, 1871.	

PROC. AMER. PHILOS. SOC. XXXI. 142. 2 W. PRINTED JAN. 17, 1894.

	Name.	*Date of Election.*	*Present Address.*
1888.	McCREATH, ANDREW S.	July 18, 1879,	Harrisburg, Pa.
1821.	McKEAN, WILLIAM V.	Feb'y 2, 1877,	Philadelphia.
2004.	McMASTER, JOHN BACH	Jan'y 18, 1884,	"
1677.	MEEHAN, THOMAS	Jan'y 20, 1871,	"
1903.	MERRICK, JOHN VAUGHAN	April 16, 1880,	"
1947.	MERRIMAN, MANSFIELD	Oct. 21, 1881,	Bethlehem, Pa.
1744.	MESSCHERT, MATHEW HUIZINGA.	Oct. 17, 1873,	Douglassville, Pa.
2142.	MICHAEL, HELEN ABBOTT.	May 20, 1887,	Philadelphia.
2175.	MITCHELL, JAMES T.	Feb'y 21, 1890,	"
1461.	MITCHELL, S. WEIR	Jan'y 17, 1862,	"
2114.	MONIER-WILLIAMS, MONIER	Dec. 17, 1886,	London, England.
1791.	MOORE, GIDEON E	Oct. 15, 1875,	New York, N. Y.
2029.	MOORE, JAMES W	Jan'y 16, 1885,	Easton, Pa.
1841.	MOREHOUSE, GEORGE R	April 20, 1877,	Philadelphia.
1054.	*Morelli.*	Jan'y 15, 1836,	*Naples, Italy.*
1976.	MORRIS, J. CHESTON.	Jan'y 19, 1883,	Philadelphia.
1577.	MORTON, HENRY	Jan'y 18, 1867,	Hoboken, N. J.
2121.	MUCH, MATTHÆUS.	Dec. 17, 1886,	Vienna, Austria.
1866.	MUHLENBERG, F. A.	Sept. 20, 1878,	Reading, Pa.
2120.	MUELLER, FRIEDERICH	Dec. 17, 1886,	Vienna, Austria.
1486.	MUELLER, F. MAX.	Jan'y 16, 1863,	Oxford, England.
2192.	MUNROE, CHARLES E.	May 15, 1891,	Washington, D. C.
1892.	MUONI, DAMIANO	Jan'y 16, 1880,	Milan, Italy.
2062.	MURDOCK, J. B.	Feb'y 19, 1886,	U. S. Navy.
1937.	MURRAY, JAMES A. H.	April 15, 1881,	Oxford, England.

N

2087.	NADAILLAC, MARQUIS DE.	May 21, 1886,	Paris, France.
1852.	NEWCOMB, SIMON	Jan'y 18, 1878,	Washington, D. C.
1582.	NEWTON, HUBERT ANSON	April 19, 1869,	New Haven, Conn.
1703.	NICHOLS, STARR HOYT	July 19, 1872,	New York, N. Y.
2060.	NIKITIN, SERGE	Feb'y 19, 1866,	St. Petersburg, Russia.
1805.	NORDENSKIÖLD, ADOLF ERIC	April 21, 1876,	Stockholm, Sweden.
1712.	NORRIS, ISAAC	Oct. 18, 1872,	Philadelphia.
2106.	NORRIS, WILLIAM F.	Dec. 17, 1886,	"
2046.	NORTH, EDWARD.	Oct. 16, 1885,	Clinton, N. Y.

O

2072.	OLIVER, CHARLES A.	Feb'y 19, 1886,	Philadelphia.
1715.	OLIVER, JAMES E.	Jan'y 17, 1873,	Ithaca, N. Y.
2195.	OPPERT, JULES.	May 15, 1891,	Paris, France.
2135.	OSBORN, HENRY F.	Feb'y 18, 1887,	Princeton, N. J.
1581.	OSBORN, HENRY S.	Jan'y 18, 1867,	Oxford, O.
2039.	OSLER, WILLIAM	Jan'y 16, 1885,	Baltimore, Md.
1801.	OWEN, P. CUNLIFFE	April 21, 1876,	London, England.

P

1868.	PACKARD, A. S., JR.	Sept. 20, 1878,	Providence, R. I.
1578.	PACKARD, JOHN H.	Jan'y 18, 1867,	Philadelphia.
1331.	PAGET, JAMES	Jan'y 20, 1854,	London, England.
1984.	PANCOAST, WILLIAM HENRY	Jan'y 19, 1883,	Philadelphia.
2036.	PARVIN, THEOPHILUS	Jan'y 16, 1885,	"
2056.	PASTEUR, LOUIS	Oct. 16, 1885,	Paris, France.
2035.	PATTERSON, C. STUART	Jan'y 16, 1885,	Philadelphia.
1282.	PATTERSON, ROBERT	April 18, 1851,	"

	Name.	*Date of Election.*	*Present Address.*
1320.	PATTERSON, THOMAS L.	April 15, 1853,	Cumberland, Md.
2213.	PATTISON, ROBERT E.	Feb. 17, 1893,	Harrisburg, Pa.
1772.	PEARSE, JOHN B.	Jan'y 15, 1875,	*Boston, Mass.*
1859.	PEIRCE, C. NEWLIN	May 3, 1878,	Philadelphia.
1722.	PEMBERTON, HENRY.	Jan'y 17, 1873,	"
2104.	PEÑAFIEL, ANTONIO	May 21, 1886,	Mexico.
2073.	PENNYPACKER, SAMUEL W. . . .	May 21, 1886,	Philadelphia.
1518.	PENROSE, R. A. F.	July 17, 1863,	"
2059.	PEPPER, EDWARD	Feb'y 19, 1886,	Paris.
1666.	PEPPER, WILLIAM	July 15, 1870,	Philadelphia.
951.	*Pereira, José Maria Dantes*. . . .	April 18, 1828,	*Lisbon, Portugal.*
1705.	PETER, ROBERT	July 19, 1872,	Lexington, Ky.
1824.	PHILLIPS, HENRY, JR.	Feb'y 2, 1877,	Philadelphia.
1760.	PLATT, FRANKLIN	July 17, 1874,	"
2127.	PLATZMAN, JULIUS.	Dec. 17, 1886,	Leipzig, Germany.
2053.	POMIALOWSKY, JOHN	Oct. 16, 1885,	St. Petersburg, Russia.
1539.	PORTER, THOMAS CONRAD	Oct. 21, 1864,	Easton, Pa.
2044.	POTTS, WILLIAM JOHN	Oct. 16, 1885,	Camden, N. J.
2097.	POSTGATE, J. P	May 21, 1886,	Cambridge, England.
2161.	POWELL, J. W.	Oct. 18, 1889,	Washington, D. C.
1619.	PRESTWICH, JOSEPH	Jan'y 15, 1869,	Shoreham, England.
1592.	PRICE, J. SERGEANT	Oct. 18, 1867,	Philadelphia.
1780.	PRIME, FREDERICK, JR	April 16, 1875,	"
2088.	PULZSKY, FRANCIS	May 21, 1886,	Buda-Pesth, Hungary.
1758.	PUMPELLY, RAPHAEL	April 17, 1874,	Newport, R. I.

Q

973.	*Quadrada, Francisco de Paolo* . .	Oct. 16, 1829,	*Madrid, Spain.*
1143.	*Quaranta, Barnardo*.	Jan'y 15, 1841,	*Naples, Italy.*

R

1736.	RAND, THEODORE D.	April 18, 1873,	Philadelphia.
1849.	RANDALL, F. A.	Jan'y 18, 1878,	Warren, Pa.
1644.	RAWLINSON, GEORGE.	Oct. 15, 1869,	Oxford, England.
1765.	RAWSON, RAWSON W	Oct. 16, 1874,	London, "
2099.	RAYLEIGH, LORD	May 21, 1886,	Essex, England.
1784.	RAYMOND, ROSSITTER W	April 16, 1875,	New York, N. Y.
1585.	RAYNOLDS, WILLIAM F.	April 19, 1867,	Detroit, Mich.
1591.	READ, JOHN MEREDITH	July 19, 1867.	
2077.	REED, HENRY	May 21, 1886,	Philadelphia.
1889.	REMSEN, IRA	July 18, 1879,	Baltimore, Md.
1948.	RENARD, A	Oct. 21, 1881,	Brussels, Belgium.
1343.	RENARD, CHARLES	Jan'y 20, 1854,	Moscow, Russia.
1890.	RENEVIER, E.	July 18, 1879,	Lausanne, Switzerland.
1816.	REULEAUX, F	Feb'y 2, 1877,	Berlin, Prussia.
2122.	RÉVILLE, ALBERT	Dec. 17, 1886,	Paris, France.
2225.	RHOADS, JAMES E	May 19, 1893,	Bryn Mawr, Pa.
1500.	RICHARDSON, BEN. WARD	April 17, 1863,	London, England.
1803.	RILEY, CHARLES V	April 21, 1876,	Washington, D. C.
1957.	ROBINS, JAMES W	April 21, 1882,	Philadelphia.
1390.	ROGERS, FAIRMAN.	Jan'y 16, 1857,	Newport, R. I.
2177.	ROGERS, ROBERT W	Feb'y 21, 1890,	Madison, N. J.
1462.	RÖHRIG, F. L. O.	April 18, 1862,	Los Angeles, Cal.
2050.	ROLLETT, HERMANN.	Oct. 16, 1885,	Vienna, Austria.
1907.	ROOD, OGDEN N	April 16, 1880,	New York, N. Y.

	Name.	*Date of Election.*	*Present Address.*
1964.	ROSNY, DE, LÉON	July 21, 1882,	Paris, France.
1732.	ROSSI, GIOVANNI BATTISTA	April 18, 1873,	Rome, Italy.
2198.	ROSENGARTEN, JOSEPH G.	Oct. 16, 1891,	Philadelphia.
1718.	ROTHERMEL, PETER F.	Jan'y 17, 1873,	Limerick P. O., Pa.
1838.	ROTHROCK, JOSEPH T	April 20, 1877,	Philadelphia.
1264.	RUSCHENBERGER, W. S. W.	Oct. 19, 1849,	"
1620.	RUTIMEYER, CARL L.	Jan'y 15, 1869,	Basel, Switzerland.
2109.	RYDER, JOHN A.	Dec. 17, 1886,	Philadelphia.

S

1766.	SADTLER, SAMUEL PHILIP	Oct. 16, 1874,	Philadelphia.
2148.	SAJOUS, CHARLES E.	Feb'y 17, 1888,	Paris, France.
1563.	SANDBERGER, FRIDOLIN	April 20, 1866,	Würtzburg, Bavaria.
1958.	SARGENT, CHARLES SPRAGUE	April 21, 1882,	Brookline, Mass.
1730.	SAUSSURE, HENRI DE.	April 18, 1873,	Geneva, Switzerland.
2211.	SCHAFFER, CHARLES	Feb'y 17, 1893,	Philadelphia.
1498.	SCHOTT, CHARLES ANTHONY	April 17, 1863,	Washington, D. C.
1864.	SCHURZ, CARL	Sept. 20, 1878.	
1725.	SCLATER, PHILLIP LUTLEY	April 18, 1873,	London, England.
1919.	SCOTT, LEWIS A.	Oct. 15, 1880,	Philadelphia.
2112.	SCOTT, W. B.	Dec. 17, 1886,	Princeton, N. J.
1870.	SCUDDER, SAMUEL HUBBARD	Sept. 20, 1878,	Cambridge, Mass.
1883.	SEILER, CARL	April 18, 1879,	Philadelphia.
1704.	SELLERS, COLEMAN	July 19, 1872,	"
1533.	SELLERS, WILLIAM.	April 15, 1864,	"
1770.	SELWYN, ALFRED R. C.	Oct. 16, 1874,	Montreal, Canada.
1728.	SELYS, DE, LONGCHAMPS.	April 18, 1873,	Liége, Belgium.
2057.	SERGI, GIUSEPPE.	Oct. 16, 1885,	Rome, Italy.
1965.	SÈVE DE BAR, EDOUARD	July 21, 1882,	Ramsgate, England.
2076.	SHARP, BENJAMIN.	May 21, 1886,	Philadelphia.
1944.	SHARPLES, PHILIP PRICE	Oct. 21, 1881,	West Chester, Pa.
1960.	SHARPLES, STEPHEN PASCHALL	April 21, 1882,	Boston, Mass.
2002.	SHARPLESS, ISAAC	Jan'y 18, 1884,	Haverford, Pa.
1797.	SHERWOOD, ANDREW	Oct. 15, 1875,	Mansfield, Pa.
1822.	SHIELDS, CHARLES W.	Feb'y 2, 1877,	Princeton, N. J.
1532.	*Shinz, Carl*	April 15, 1864,	*Strasburg, Germany.* (?)
2146.	SMITH, EDGAR F.	Oct. 21, 1887,	Philadelphia.
1544.	SMITH, GOLDWIN.	Jan'y 20, 1865.	
1789.	SMITH, STEPHEN	Oct. 15, 1875,	New York, N. Y.
2141.	SMYTH, ALBERT H.	May 20, 1887,	Philadelphia.
1742.	SNOWDEN, A. LOUDON	Oct. 17, 1873,	"
2009.	SNYDER, MONROE B.	Jan'y 18, 1884,	"
2189.	SPANGLER, HENRY W	May 15, 1891,	"
1720.	SPOFFORD, A. R.	Jan'y 17, 1873,	Washington, D. C.
1949.	STALLO, JOHN B.	Oct. 21, 1881,	Cincinnati, O.
1446.	STEENSTRUP, J. J. S.	Jan'y 17, 1862,	Copenhagen, Denmark.
1990.	STEVENS, WALTER LECONTE	Jan'y 18, 1884,	Troy, N. Y.
1840.	STEVENSON, JOHN JAMES.	April 20, 1877,	New York, N. Y.
2168.	STOKES, GEORGE G.	Dec. 20, 1889,	London, England.
1834.	STRAWBRIDGE, GEORGE	Feb'y 2, 1877,	Philadelphia.
1559.	STRONG, WILLIAM	Jan'y 19, 1866,	Washington, D. C.
1820.	STUART, GEORGE.	Feb'y 2, 1877,	Philadelphia.
2193.	STUBBS, WILLIAM	May 15, 1891,	Oxford, England.
2094.	SUESS, EDWARD	May 21, 1886,	Vienna, Austria.
2023.	SYLE, E. W.	July 18, 1884,	Philadelphia.

	Name.	*Date of Election.*	*Present Address.*
1844.	SYLVESTER, J. J.	July 20, 1877,	Oxford, England.
2092.	SZOMBATHY, JOSEF	May 21, 1886,	Vienna, Austria.

T

1786.	TATHAM, WILLIAM P.	April 16, 1875,	Philadelphia.
1846.	TAYLOR, WILLIAM B.	Oct. 19, 1877,	Washington, D. C.
2098.	TEMPLE, RICHARD CARNAC	May 21, 1886,	Upper Burmah, India.
2006.	THOMAS, ALLEN C.	Jan'y 18, 1884,	Haverford, Pa.
1807.	THOMSON, ELIHU	April 21, 1876,	Swampscott, Mass.
1993.	THOMPSON, HEBER S.	Jan'y 18, 1884,	Pottsville, Pa.
1726.	THOMPSON, HENRY.	April 18, 1873,	London, England.
1754.	THOMSON, FRANK	April 17, 1874,	Philadelphia.
1723.	THOMSON, WILLIAM (see LORD KELVIN)	April 18, 1873,	London, England.
1909.	THOMSON, WILLIAM	April 16, 1880,	Philadelphia.
1530.	THURY, A.	April 15, 1864,	Geneva, Switzerland.
1688.	TILGHMAN, BENJAMIN C	July 21, 1871,	Philadelphia.
1233.	TILGHMAN, RICHARD A	April 16, 1847,	"
1657.	TILGHMAN, WILLIAM M.	Jan'y 21, 1870,	"
2176.	TIMMINS, SAMUEL	Feb. 21, 1890,	Arley, near Coventry, Eng.
2123.	TOPINARD, PAUL.	Dec. 17, 1886,	Paris, France.
2065.	TOPPAN, ROBERT NOXON.	Feb'y 19, 1886,	Cambridge, Mass.
1597.	TOWNSEND, JOSEPH B	Jan'y 17, 1868,	Philadelphia.
1955.	TOWNSEND, WASHINGTON	Jan'y 20, 1882,	West Chester, Pa.
1691.	TROWBRIDGE, WILLIAM P	Jan'y 19, 1872,	New York, N. Y.
2024.	TRUMBULL, HENRY CLAY	July 18, 1884,	Philadelphia.
1973.	TSCHERMAK, GUSTAF	Oct. 20, 1882,	Vienna, Austria.
1983.	TURRETTINI, THEODORE	Dec. 19, 1890,	Geneva, Switzerland.
2166.	TUTTLE, DAVID K	Oct. 18, 1889,	Philadelphia.
2163.	TYLER, LYON G	Oct. 18, 1889,	Williamsburg, Va.
1529.	TUNNER, PETER	April 15, 1864,	Leoben, Austria.
2138.	TYSON, JAMES	May 20, 1887,	Philadelphia.

U

2185.	UNWIN, WILLIAM C	Dec. 19, 1890,	London, England.

V

2000.	VAUX, RICHARD.	Jan'y 18, 1884,	Philadelphia.
2045.	VERE, DE, SCHEELE M.	Oct. 16, 1885,	University of Virginia, Va.
1475.	VIRCHOW, RUDOLPH.	Oct. 17, 1862,	Berlin, Prussia.
1646.	VOGT, CARL	Oct. 15, 1869,	Geneva, Switzerland.
2115.	VON MELTZEL, HUGO	Dec. 17, 1886,	Koloszvar, Hungary.
1670.	VOSE, GEORGE LEONARD.	Oct. 21, 1870,	Boston, Mass.
2186.	VOSSION, LOUIS	Dec. 19, 1890,	Philadelphia.

W

2034.	WAGNER, SAMUEL	Jan'y 16, 1885,	Philadelphia.
1748.	WAHL, WILLIAM H.	Jan'y 16, 1874,	"
1724.	WALLACE, ALFRED R	April 18, 1873,	Parkston, Dorset, England.
2156.	WARD, LESTER F.	May 17, 1889,	Washington, D. C.
2033.	WEIL, EDWARD HENRY	Jan'y 16, 1885,	Philadelphia.
2028.	WEISBACH, ALBIN	Jan'y 16, 1885,	Freiburg, Saxony.
1639.	WHARTON, JOSEPH.	April 16, 1869,	Philadelphia.

PROC. AMER. PHILOS. SOC. XXXI. 142. 2 X. PRINTED JAN. 15, 1894.

	Name.	*Date of Election.*	*Present Address.*
1637.	WHITE, ANDREW D.	April 16, 1869,	Ithaca, N. Y.
1848.	WHITE, ISRAEL C.	Jan'y 18, 1878,	Morgantown, W. Va.
1487.	WHITNEY, JOSIAH DWIGHT	Jan'y 16, 1863,	Cambridge, Mass.
1502.	WHITNEY, WILLIAM DWIGHT.	April 17, 1863,	New Haven, Conn.
1863.	WILDER, BURT GREEN	May 3, 1878,	Ithaca, N. Y.
2151.	WILLIAMS, TALCOTT	May 18, 1888,	Philadelphia.
2178.	WILLIS, HENRY	Feb'y 21, 1890,	"
2150.	WILSON, EDMUND B	Feb'y 17, 1888,	Bryn Mawr, Pa.
2041.	WILSON, JAMES CORNELIUS.	Jan'y 16, 1885,	Philadelphia.
1747.	WILSON, JOSEPH M.	Jan'y 16, 1874,	"
2137.	WILSON, WILLIAM POWELL	May 20, 1887,	"
2223.	WINSOR, JUSTIN	May 19, 1893,	Cambridge, Mass.
1896.	WINTHROP, ROBERT C.	Jan'y 16, 1880,	Boston, Mass.
2140.	WIREMAN, HENRY D.	May 20, 1887,	Philadelphia.
2220.	WISTAR, ISAAC J.	May 19, 1893,	"
1561.	WISTER, OWEN JONES	April 20, 1866,	"
1884.	WOOD, RICHARD.	April 18, 1879,	"
1762.	WOODWARD, HENRY.	July 17, 1874,	London, England.
1751.	WOOTTEN, J. E.	Jan'y 16, 1874,	Reading, Pa.
1854.	WORMLEY, THEODORE G.	Jan'y 18, 1878,	Philadelphia.
1932.	WURTS, CHARLES STEWART	Jan'y 21, 1881,	"
2061.	WYCKOFF, A. B.	Feb'y 19, 1886,	U. S. Navy.

Y

1904.	YARNALL, ELLIS	April 16, 1880,	Philadelphia.
1759.	YOUNG, CHARLES AUGUSTUS	April 17, 1874,	Princeton, N. J.

the Science and Philosophy of Jurisprudence, and to the preparation of the certificate to be granted to the author of any successful essay.

Fourth. Competitors for the prize shall affix to their essays some motto or name (not the proper name of the author, however), and when the essay is forwarded to the Society, it shall be accompanied by a sealed envelope containing within the proper name of the author, and, on the outside thereof, the motto or name adopted for the essay.

Fifth. At a stated meeting of the Society, in pursuance of the advertisement, all essays received up to that time shall be referred to a Committee of Judges, to consist of five persons, who shall be selected by the Society from nomination of ten persons made by the Standing Committee on the Henry M. Phillips Prize Essay Fund.

Sixth. All essays may be written in English, French, German, Dutch, Italian, Spanish or Latin; but, if any language except English, must be accompanied by an English translation of the same.

Seventh. No treatise or essay shall be entitled to compete for the prize that has been already published or printed, or for which the author has received already any prize, or profit, or honor, of any nature whatsoever.

Eighth. All essays must be *clearly* and *legibly* written and on one side of the paper only.

Ninth. The literary property of such essays shall be in their authors, subject to the right of the Society to publish the crowned essays in its Transactions or Proceedings.

Tenth. A Standing Committee, to consist of five members appointed by the President, and, *ex officio*, the President and the Treasurer of the Society, shall continue in office during the pleasure of the Society, and any vacancies that may occur in said Committee shall be filled by new appointment by the President.

Eleventh. The said Committee shall have charge of all matters connected with the management of this endowment and the investment of the same, and shall make such general rules for publishing the terms upon which said prize shall be competed for, and the amount of the said prize, and, if it shall deem it expedient, desig-

nate the subjects for competing essays. It shall report annually to the Society, on the first Friday in December, all its transactions, with an account of the investment of the Prize Fund, and of the income and expenditures thereof.

An award of the Prize will be made during the year 1895; essays for the same to be in the possession of the Society before the first day of January, 1895. The subjects upon which essays are to be furnished by competitors are as follows:

1. *The sources, formation and development of what is generally designated the Common Law of England.*

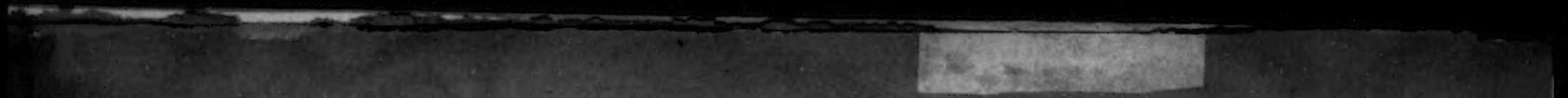
2. *The theory of the State, treated historically and upon principle, with a discussion of the various schools of classical, mediæval, and modern thought upon the subject.*

3. *The historical and doctrinal relations of the Roman Law and the English Law, illustrated by parallels and contrasts.*

The Prize for the crowned essay on either of these subjects will consist of the sum of five hundred dollars lawful gold coin of the United States, to be paid upon the awarding of the Prize.

The essays must be sent, addressed to Frederick Fraley, President of the American Philosophical Society, Hall of the Society, No. 104 South Fifth Street, Philadelphia, Pa.

☞ Members who have not as yet sent their photographs to the Society will confer a favor by so doing; cabinet size preferred.

☞ Members will please communicate any change of address or inaccuracy in name.

☞ A few sets of the Society's Transactions, New Series, 1818 to 1892, XVII vols., 4to, can be obtained from the Librarian. Price $85.00.